

WATERTON BIOSPHERE RESERVE

Periodic Review Report, 2008



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BIOSPHERE RESERVE PERIODIC REVIEW FORM - CANADA

[2008]

1. Name of the Biosphere Reserve **Waterton Biosphere Reserve**

1a. Please provide a location map, and a map of the zonation for the biosphere reserve (for ease of reference) Appendix A.

1b. Year designated: 1979 Year of first periodic review: 1997

1c. Changes or corrections to be made in the information for the UNESCO/MAB Biosphere Reserve Directory.

General Description: Waterton has a permanent population of 40 people and a seasonal overnight population of 1,000-2,000 during the summer peak season (2007).

1d. Brief summary of the follow-up actions taken in response to each of the UNESCO recommendations from the first periodic review (where applicable).

Following the 1997 periodic review, the Canada/MAB Advisory Committee on Biosphere Reserves recognized the existence of well-defined core and buffer zones in Waterton, and that a flexible approach had been taken with regard to the transition zone. Three specific recommendations were issued for the Waterton Biosphere Reserve: (1) to consider the possibility of a transborder biosphere reserve with Glacier National Park/Biosphere Reserve or a larger biosphere reserve within the 'Crown of the Continent' bioregion; (2) to explore a means to adopt a more coherent management policy linking Waterton Lakes National Park with the transition area; and (3) to extend ecosystem monitoring beyond the national park 'core' to include the rest of the WBR, and link up where possible with monitoring in adjacent lands (e.g., study the potential impacts of mining activities in neighbouring areas (Advisory Committee on Biosphere Reserves, fifth meeting, 1998)).

[1] The suggestion that a single international 'Rocky Mountain Biosphere Reserve' could merge the Canada-U.S. biosphere reserves and encompass the adjoining Akamina-Kishinena provincial park in province of British Columbia was put forward by the IUCN in 1995 when Waterton-Glacier International Peace Park was first designated a UNESCO World Heritage Site. By 2004 it was clear that action on such a binational merger was unlikely and that the decision to expand

Waterton Lakes National Park into the Flathead Valley of British Columbia was also deferred (Periodic Report on the Implementation of the World Heritage Convention, 2004).

However, the ‘Crown of the Continent’ concept has been significantly developed over the last decade, as a variety of new organizations and collaborations (such as the Crown Managers’ Partnership) have arisen in response to increased development pressures on critical habitat. This larger regional movement has provided the context for the second periodic review recommendation to be pursued. With strong support from the Waterton Lakes National Park (WLNP) and Waterton Biosphere Association (WBA), the Waterton Biosphere Reserve (WBR) was instrumental in communicating the opportunity to conserve traditional ranchlands adjacent to the national park to the Nature Conservancy of Canada, resulting in the creation of the largest private conservation initiative in Canadian history. The 14,164 hectares of southern Alberta grasslands, known as the Waterton Front Range, provide a substantial buffer-type area on the north and eastern sides of the park. This new initiative, along with increased development pressures in the region may guide the biosphere reserve to re-evaluate its current zonation. Discussions about whether to formally designate a transition zone (or ‘area of cooperation’) for WBR based are currently underway with a small group of key stakeholders.

Similar to other national parks, the surrounding communities in Waterton Lakes demonstrate varying levels of involvement, cooperation or conflict depending on the issues that affect them. The Waterton Biosphere Association (WBA) has therefore worked very closely with local people for over 30 years to integrate conservation values with traditional livelihoods. The WBR has to now assess whether its original flexible boundaries (approximately 20 km surrounding the park to the north and east) should be formally delineated on a map to include the Waterton Front Range as an Area of Cooperation for the biosphere reserve. Essentially, the process of linking the core and buffer areas (within the national park) with surrounding lands and larger landscapes is ongoing under the ‘Crown of the Continent’ movement. The biosphere reserve continues to contribute to this larger vision of biodiversity conservation and sustainable development.

[2] The second recommendation that came from the 1997 periodic review was “strengthened capabilities [for WBA] to take on tasks especially if they are to be set in the larger regional

context.” Specifically, this might involve: formal incorporation of the WBA as a non-profit organization, a wider membership base and accompanying budget to support staff services. Although the WBA itself has remained a relatively small organization and has not chosen to incorporate as a charitable organization, the core WBA function has been ‘catalytic’ leadership ‘behind the scenes’ to work with existing networks and to inspire new initiatives for others to adopt and develop (e.g., the NCC Front Range project, the Chinook Area Land Users Association common land use policy). At other times, the WBA participates as one member of a much larger network of organizations dedicated to sustainability planning, conservation research, and monitoring (e.g., the Southern Foothills cumulative effects study).

[3] With regard to the third recommendation, the 1997 periodic review suggested extending ecosystem monitoring beyond the national park ‘core’ to include the rest of the WBR, and link up with monitoring that might be occurring in adjacent lands. In 1998, a monitoring strategy was designed as part of the Ecosystem Conservation Plan for Waterton Lakes National Park. Many of these actions have since been incorporated into the park management plan (2000). Information collected from these programs are used in a State of the Park Report (prepared every five years in conjunction with a review of the management plan) in accordance with the Canadian National Parks Act.

The most recent monitoring activities undertaken by the Waterton Lakes National Park respond to the recommendation for extending ecosystem monitoring beyond the biosphere reserve’s core. Specifically, Parks Canada has legislated a long term Ecological Integrity Monitoring Program for implementation in 2008. WLNP has developed a monitoring program in collaboration with other parks in the Montane-Cordillera bioregion with six common indicators of scientific value that can also be easily communicated to the general public (see Appendix B for a draft of these indicators). These indicators were designed with the Crown of the Continent in mind and will therefore be used for regional comparisons with Glacier National Park’s ‘Vital Signs’ ecological integrity monitoring program and with the Nature Conservancy of Canada’s monitoring work on adjacent lands. The Crown of the Continent Ecological Health Initiative (2008) will initially focus on landscape indicators for sustaining grizzly bear populations. Together these programs

will help to provide a basis for comparative environmental change between ‘benchmark’ sites within the core areas of the park and managed sites outside of it, across the bioregion as a whole.

The ‘Crown of the Continent Data Atlas’ (1994) that was referred to in the 1997 periodic review is now formally affiliated as an institute with the University of Calgary (Miistakis Institute for the Rockies www.rockies.ca). The board of directors for the Institute includes representatives from academia as well as provincial and federal agencies, including Parks Canada. The Institute exists to serve the public interest in overcoming barriers to ecosystem research and management by offering a non-partisan information base. Their primary emphasis is as the Secretariat for the Crown Managers Partnership.

1e. Other observations or comments on the above.

Several factors present the Waterton Biosphere Reserve with unique challenges and opportunities to fulfilling the three functions of its mandate (conservation, sustainable development, and logistic role). These include: (1) the age of the biosphere reserve and its phases of administrative activity, (2) its multiple international designations, (3) the critical location of the biosphere reserve in terms of larger scale transboundary issues, and (4) the high concentration of development pressures. Each of these factors are noted briefly below.

(1) Waterton Lakes National Park was the first national park in Canada to be included in a Biosphere Reserve. As a first-generation “pre-Seville” biosphere reserve, the national park became the core area, with buffer and transition zones largely undefined. To advance the concept, the Waterton Biosphere Association (WBA) was established in the early 1980’s and worked to build awareness among surrounding landowners and organizations in a relatively sparsely populated region.¹

¹ Unlike many countries, Canada does not have a central government agency responsible for biosphere reserves. Instead, each biosphere reserve is a community-based initiative, dependent upon local collaborative arrangements to foster the three main functions of biosphere reserves, while drawing financial and in-kind support from an array of government agencies, foundations, and other partner organizations.

Although the WBA has been relatively inactive in recent years (i.e., fewer members and fewer meetings) it has received continuous support from Waterton Lakes National Park staff. The park plays a major role in conservation, research, education and monitoring (An extensive list of research undertaken in the park between 1986-2004 appears in Appendix C, and research from 2005-2007 appears in Appendix D). At times, there has been a perception that the Waterton Biosphere Reserve is not a functioning biosphere reserve. However, the reviewers support the view that a formalized administrative structure is only one element of a successful biosphere reserve and that the WBA has played small but critical roles in expanding conservation initiatives, fostering sustainable development, and providing education, along with the park's support of research and monitoring. Indeed, there are numerous examples of how the park and various partner organizations and individuals have participated in an ecosystem-based management approach, resulting in tangible benefits to both the park and to the larger regional ecosystem (Cowley and Lieff, 1984; Lieff, 1985; Birtch, 1988; Dolan and Frith, 2003), as noted below.

(2) Waterton Lakes is the only park or protected area in Canada to receive three international designations - part of the world's first International Peace Park (1932), a UNESCO Biosphere Reserve (1979) and part of a UNESCO World Heritage Site (1995). While each of these designations is an honour and a responsibility to uphold in its own right, multiple programs may be difficult to distinguish by the public at large. Rather than constantly trying to separate the designations, they are presented as equally important (e.g., by park staff or interpretive signs) and are often used interchangeably by the public. The biosphere reserve concept, therefore, has not become as distinctive in the Waterton region, as it has in other Canadian biosphere reserves.

(3) Waterton Biosphere Reserve is located in the corner of southwestern Alberta, bordering on the Canadian province of British Columbia and the U.S. state of Montana. From an ecological perspective, it is located on the eastern slopes of the Rocky Mountains, "where the prairies meet the mountains" and provides a corridor for wildlife movements and other natural ecological processes. From a cross-scale perspective, the Waterton Biosphere Reserve is relatively small and the core area of parkland is unable to sustain wide-ranging wildlife. Additional challenges arise in maintaining ecological processes like wild fire within the context of variable social and

economic realities. In this situation, an ecosystem-based management approach has historically been an important element of the park's program.

However, Waterton Biosphere Reserve is also nested within a much larger, continental landscape and constitutes a critical junction or "choke point" in what is known as the "Crown of the Continent Ecosystem." (See Figure 2, p. 26) It is located at the narrowest point along the Rocky Mountain corridor – a key sector in the much larger mountain corridor identified as the Yellowstone to Yukon (Y2Y) initiative. The Waterton Biosphere Reserve lies in the very heart of this region.

The 44,000 km² Crown of the Continent is internationally acclaimed as one of the largest remaining intact ecosystems in North America - a truly magical landscape. The region is governed by a complex jigsaw puzzle of political, jurisdictional/administrative, and cultural dividing lines. An international border divides the United States and Canada. Twenty-one federal, First Nation (aboriginal), provincial, and state agencies manage 83 percent of lands and resources within the region. County, municipal, and non-governmental officials and private landowners and citizens also influence decisions affecting life in this region.

In 2001, at the first Crown Managers Forum, both Waterton Lakes National Park and its U.S. counterpart, Glacier National Park, were instrumental in forging the transboundary multi-stakeholder Crown Managers Partnership (CMP) among 20 management agencies and other non-governmental organizations. The Crown of the Continent Network (2008) now officially recognizes 171 partners, including the Waterton Biosphere Association (Appendix E).

(4) Finally, the landscape of which the Waterton Biosphere Reserve is a part faces a high concentration of development pressures, including: threats to wildlife and critical habitat; uneven distribution of water, land, and energy resources; and social turbulence as economies diversify from a base of natural resource use to knowledge-industry and residential and tourism amenity-oriented growth. People are concerned about changes at the local and sub-regional level that, together, put the larger Crown ecosystem and social fabric at risk. In broad terms, people are concerned about changes affecting their quality of life, such as:

- Residential and commercial sprawl.
- Threats to the rural lifestyle.
- Energy and resource exploration and development.
- Fragmentation of wildlife habitat and migration routes.
- Genetic isolation of endangered species populations.
- Declining water quality.
- Drought and declining water supply.
- Wildfire management.
- Economic stagnation.
- Noxious weeds.
- A warming climate (Crown of the Continent Network, 2008).

2. Significant changes in the biosphere reserve during the past ten years.

2a. Brief summary overview.

Narrative account of important changes in the local economy, landscapes or habitat use, and other related issues. Note important changes in the institutional arrangements for governance for the biosphere reserve area, and changes (if any) in the coordinating arrangements (including the local biosphere reserve organization) that provide direction for the biosphere reserve. Note the role of local biosphere reserve organization in initiating or responding to these changes.

Since 1997, the Waterton Biosphere Reserve has experienced a number of significant changes in the region surrounding the Waterton Lakes National Park core area. The most significant of these for habitat conservation is the Front Range initiative designated by the Nature Conservancy of Canada. These 14,164 ha extend legal protection to the Foothills Parkland Ecoregion adjacent to the national park. At the same time, traditional ranching values and practices are maintained as ranchers lease back the land. This initiative integrates conservation of biodiversity and critical habitat with sustainable land use. The Waterton Biosphere Association in partnership with Waterton Lakes National Park developed a video² in 1997 to communicate the urgency and the opportunity for rangeland conservation to the NCC. The WBA acted as an effective catalyst to draw attention to these issues and then later acted as a broker between conservation agencies and private landowners for this historic land securement. It also helped found the Southern Alberta Land Trust Society (SALTS) that has continued and expanded this work.

² The Waterton Biosphere Reserve video "Waterton Park Front: A Legacy in Peril" was produced in partnership with Waterton Lakes National Park in 1997. It is available on VHS.

In terms of economic development, the major sectors represented in the Waterton area are: agriculture, residential and recreational development (subdivisions, seasonal homes, etc.), oil and gas, wind energy, and ranching. Although the oil and gas sector is still present in the area it has become less important over time as the resource pools become smaller and gas plants downsize and wells are decommissioned. In addition to significant new housing developments, the construction of 250 wind turbines in the Municipal District of Pincher Creek is a significant change on the landscape and there are plans for at least 250 more. As a non-advocacy organization, the Waterton Biosphere Association will urge the municipality to hold a public referendum on this issue.

Native range management has slowly improved in some places; however, the outbreak of bovine spongiform encephalopathy (BSE or “mad cow” disease) on 20 May 2003 resulted in a ban on exporting beef to the U.S. and Mexico. Demand for beef dropped 50% at that time and ranchers were forced to sell for less in Canada or maintain and expand their herds, which has since put increased pressure on range quality. The WBA has actively supported the Alberta Organic Producers Association and experiments with small organic beef cooperatives, such as Diamond Willow Producers Ltd.

Recent government subsidy programs for producing biofuels now places additional pressure on ranching as the price of cattle declines against the rising price of grain. The effects of climate change have become more evident with warmer, drier winters and droughts in summer (e.g., 110 days without rain in 2007). If these trends continue, rangelands will suffer, water management will be (or is already) an urgent issue and ranching will face a serious crisis.

Other developments include seismic surveys to assess resource availability, the continued extraction of sour gas (hydrogen sulfide) as well as sweet gas, and the potential for extracting “tight gas” where the gas doesn’t flow well and multiple wells are close together. The re-working of oil and gas fields (to use new technology on small, older wells for lateral drilling) raises concerns about the potential for methane gas leaks into drinking (water) wells. Landowners have discovered that their land is staked for uranium mining (which involves the use of acid for extraction at shallow depths that may also contaminate ground water supply) and some areas are

staked for wind turbines. (Note: surface rights to land and subsurface rights to resources are legally separated in Alberta).

To the northwest of Waterton are proposals for open pit coal mines and coal bed methane (CBM) extraction in the Flathead Valley of British Columbia. A number of organizations in both Canada and the U.S. have expressed their concerns about impacts to the headwaters of the Flathead River Basin and the Oldman River Basin. During 2002-2004, Parks Canada worked with the Government of British Columbia to assess a proposal to protect a rugged landscape in the Flathead Valley in a national park reserve, immediately west of Waterton Lakes National Park of Canada. Protection of this area would enhance the ecological integrity of the existing national park and complete the missing corner of the International Peace Park. However, during negotiation of the 2003 Canada – British Columbia Memorandum of Understanding, the provincial government did not support a feasibility study and therefore no work was done. Should the province agree, the government of Canada remains interested in proceeding with this study.

The governance of provincial resource development, on both public and private lands, is a highly complex and often controversial issue. The provincial government of Alberta has reduced opportunities for public intervention (Bill 49) to which landowners' groups are finally "speaking out" with their concerns and are prepared to go to court with the provincial Energy Utilities Board. There have been over 200 landowners' groups organized in Alberta. The ones on the eastern slopes (Waterton region) include: Pekisko, Chinook, Livingston, Chief Mountain and South Porcupine. They are often supported by a range of environmental NGOs in their petitions to the government. The Waterton Biosphere Association prefers to take a non-advocacy role and instead provides background information and education on the ecological impacts of unsustainable development, including the Southern Foothills Study's scenarios for regional development.

The Southern Foothills Study (available on DVD) sponsored by landowners' groups and the Southern Alberta Land Trust Society uses the Alberta Landscape Cumulative Effects Simulator (ALCES) project current growth trends over the coming decades and try to anticipate major

impacts, conflicts, and alternative development scenarios. A second study closer to the Waterton Biosphere Reserve known as the Chief Mountain Cumulative Effects Study is underway using the same ALCES model. The Waterton Biosphere Association, landowners' groups, the municipalities of Cardston and Pincher Creek, the national park, and some companies, like Shell, have all supported this initiative. ALCES provides the public and managers with a powerful modeling tool to reveal threats to the sustainability of ecological systems.

Although the main institutional arrangements for the biosphere reserve remain the same (core protected area under national park jurisdiction and the non-profit Waterton Biosphere Association working in buffer and transition-type areas), other groups have emerged over the past ten years and are listed in section 6. One of the most interesting groups is the Crown of the Continent Managers Partnership (CMP). As noted above, this high-level transboundary partnership brings together representatives from various Canadian and U.S. agencies and First Nations to maintain the Crown's ecological integrity and address the human demands on the Crown region through coordinated and collaborative research efforts. The Miistakis Institute based at the University of Calgary acts as a facilitator and neutral third party and provides a coordinating Secretariat function for the CMP.

2b. Updated background information about the biosphere reserve.

(The section ¶ numbers here refer to the Biosphere Reserve Nomination Form, February 2004 version. Please identify changes or corrections that may be needed in the information pertaining to the following.)

(i) Size and spatial configuration (¶ 7). Composition of core areas, buffer zones, and/or extent of transition area.

The total area of the Waterton Biosphere Reserve is 50,597 ha (505 km²) which reflects the total area of the Waterton Lakes National Park. Of this, 46,285 ha are considered core area (represented by the Special Preservation, Wilderness, and Natural Environment zones within the park) and 6,312 ha are considered buffer areas (or Outdoor Recreation Zone within the park). See Appendix A for a map of the national park's zonation. The transition zone of the biosphere reserve or 'area of cooperation' is not defined but is generally taken to extend 20 km to the east and north of the national park.

With the recent conservation of 14,164 ha of adjacent ranchlands, there is a question for the Waterton Biosphere Reserve about more formally defining the transition zone of the biosphere reserve. If the Nature Conservancy’s Front Range initiative were included in the biosphere reserve boundaries, then the total spatial configuration would be 66,761 ha. As the WLNP superintendent has noted: Without formal delineation, “Waterton Biosphere Reserve has essentially one of the most effective buffers of any biosphere reserve in North America.” Indeed with the restrictions that may come into effect with the Castle Wilderness area north of the park, the potential buffer area could be quite large.³ However, since the term “buffer” has been widely used in provincial and park planning processes and was received quite negatively by surrounding landowners (that perceive buffer zones as imposing new restrictions), members of the WBA question the value of formalizing expanded boundaries (through a UNESCO submission, for example) when the current informal arrangements have been positive and highly collaborative.

However, the WBA also recognize that the time may be right for considering the geographic configurations of WBR; indeed this Periodic Review provided the occasion for organizing a preliminary meeting on that very issue. Further options for expansion and alternatives are currently under discussion by a small group of stakeholders, but no formal decision about WBR zonation has been made to date. A public forum about this issue is scheduled for June 21, 2008. The meeting also has the goal of forming a broad committee that will: (a) Outline the basic principles to be achieved or maintained with the Castle Special Place as a protected area; and (b) Draft the conceptual proposal for establishing the Castle Special Place within Alberta’s protected areas and parks system.

(ii) Human population of the biosphere reserve (¶ 10). Most recent census data.

	1996 Census Data	2006 Census Data
Waterton Lakes population	279	160

³ Originally part of the Waterton Lakes National Park, but removed in 1921, the Castle Wilderness is a 1040 square kilometer area, containing the Oldman River watershed, and located on the north boundary of the national park. First proposed by the provincial government for a park in 1974, the Andy Russell - l’tai sah kòp Wildland Park is considered a critical piece of the Crown of the Continent Ecosystem. Provincial park designation of this area would limit the cumulative human impact from roads, logging and petroleum development and more recent recreation pressures. No decision by the Government of Alberta’s Minister of Tourism, Parks, Recreation, and Culture has been made on this proposal to date.

Seasonal population	2,250 in peak season	2,000
Park Visits	350,000	363,000
Population of Mountain View	64	n/a
Population of Twin Butte	16	813 (7 km radius)
Municipal District of Pincher Creek	3,172	3,309
Town of Pincher Creek	3,659	3,625
Municipal District of Cardston	4,565	4,037
Town of Cardston	3,417	3,452
Piikani (Peigan) Indian Reserve	1,662	1,300
Blood Indian Reserve	4,326	4,177
Total Regional Population (excluding Park Visitors)		20,873

Figure 1 shows the areas of human settlement in Alberta surrounding Waterton Biosphere Reserve in the district municipalities of Cardston and Pincher Creek.



Figure 1. Map of communities in southwestern Alberta (MapQuest, 2008).

(iii) Most recent 30 year climate normals (1971-2000) for weather stations in the biosphere reserve.

Climate Station	Cardston	Pekisko	Waterton River Cabin
Station ID Number	3031320	3055120	3057243
Latitude	49° 7.800' N	50° 22.200' N	49° 7.200' N
Longitude	113° 14.00' W	114° 25.200' W	113° 49.800' W
Elevation (metres)	1193.0	1439.00	1281.00
Average daily temperature (°C) in warmest month	16.9	13.1	15.2
Average daily temperature (°C) in coldest month	-6.0	-8.6	-5.2
Total precipitation (mm) of which falls as snow (mm)	557/219.8	682.6/318.2	807.7/383.7

(iv) Biological characteristics (¶ 12). Note briefly here or refer to 3a below.

Waterton Lakes is a relatively small national park at 505 square kilometers. The convergence of the Great Plains and the Rocky Mountains, the infamous Chinook winds and the traditional use of fire by aboriginal peoples, have all contributed to a landscape with exceptional biodiversity, particularly in terms of vegetation. These factors, have, in turn, supported highly visible wildlife populations amidst open scenic vistas, where *the prairies meet the mountains*. However, the size of the park is small relative to ecological processes like wildfire or wide ranging species like grizzly bear. This reality underscores the importance of an ecosystem based management approach with a number of adjacent jurisdictions.

Habitat types listed in the MAB Directory of Biosphere Reserves for Waterton are as follows: prairie grasslands, alpine tundra/high meadows, arctic-alpine communities, lower sub-alpine forests, deciduous forests, coniferous forests, lakes and freshwater wetlands, and disturbed heavily grazed lands. Each of these habitat types continue to be present in the WBR. The four ecoregions used within Waterton Lakes National Park (that could correspond with UNESCO's habitat types) are: Alpine Ecoregion, Sub-Alpine Ecoregion, Montaine Ecoregion and the Foothills Parkland Ecoregion.

Notable changes in the alpine and sub-alpine regions are with respect to climate change, fire suppression and forest encroachment into the sub-alpine region. A University of Victoria study of landscape change over 100 years found a 25% loss of grasslands to forest encroachment. This may be due to the lack of fire in the Montane ecoregion (usually more mixed species following

fires every 7 years on average). Other observed changes include increases in mule deer and white tailed deer and a corresponding rise in mountain lion (cougar) populations (Smith, pers comm., 2007).

(v) Development function (§ 14). Note briefly here or refer to 4a,b,c below).

The two primary sustainable development functions in Waterton Biosphere Reserve are the conservation, tourism and recreation functions of the Waterton Lakes National Park and the continuation of traditional ranching livelihoods that support rangeland biodiversity and wildlife habitat. Support for an organic beef market has also emerged (See section 4 below).

(vi) Logistic support function (§ 15). Note briefly here or refer to 5a,b, below)

The Waterton Biosphere Association is involved primarily with education through the national park's Land Care program for the grade 7 curriculum ("Ecosystems and Interactions") and adapted presentations on protected areas management for University of Lethbridge and college students. This program is offered seven times a year and teaches land use management from the multiple perspectives of First Nations, ranchers, and park managers. The Science Alberta Foundation has been a partner for grade 9 biodiversity curriculum. Students from the Blood and Piikani First Nations also attend the park programs and elders from these communities participate in a storytelling program at the park each summer.

WBR hosts the University Transboundary Internship Program for the universities of Montana and Calgary in support of this graduate program. Students from both countries are placed in graduate internships which focus on transboundary issues and initiatives. It also facilitates some of the research projects of the Miistaskis Institute at the University of Calgary.

The Crown of the Continent Environmental Education Consortium (COCEEC) was established in 1995 to bring a bioregional focus to education across Alberta and Montana. Some of the educational products include a *Map Without Boundaries* and an educational resource guide for schools, entitled the *Crown of the Continent Ecosystem: Profile of a Treasured Landscape*. The

Waterton Lakes National Park is a member of COCEEC which supports the Waterton Natural History Association, special courses and guest speakers.

The WBA builds capacity for other organizations conducting research (such as the Chief Mountain Cumulative Effects Study) and participates in a wide network of other organizations and issues.

The Waterton Lakes National Park has a mandate for research and monitoring related to ecological integrity under the National Parks Act (2000). They support a wide range of research efforts, provide research facilities such as backcountry cabins, and maintain a database of their own and guest researchers' projects through an online permit system (Appendices C and D).

(vii) Institutional aspects (¶ 17) Changes (if any) in hierarchy of administrative divisions. Refer to 6 below.

No major changes in the administration of the Waterton Biosphere Reserve. Regional organizations and coalitions are emerging at larger landscape scales and local landowners' associations also seem to be proliferating in response to resource and development pressures in southwestern Alberta. Organizations and initiatives related to Waterton are listed in section 6, with the broader list of organizations represented by the Crown of the Continent Network listed in Appendix E.

2c. The biosphere reserve organization and/or biosphere reserve associated group(s). Comment on the following topics that are of special interest in the experience of the Canadian network.

(i) Cooperation plan up-dated, including vision statement, goals and objectives, either current or for the next 5-10 years.

Waterton Biosphere Reserve does not have a cooperation plan.⁴ It has the original terms of reference for a WBR management committee (1984) and these are under review by the WBA. A

⁴ In 2002, CBRA developed the *Cooperation Plan* as a tool for biosphere reserve coordination and tested it in ten Canadian biosphere reserves. Plans involve local consultation and contain: background, vision, challenges, goals for the three functions of a biosphere reserves, partnership roles, and resources and strategies to achieve goals. Projects that emerge from the plans are often led and financed by partners or

cooperation plan may result from the public forum discussions about extending the biosphere concept and fluid boundaries. Regardless of biosphere zonation, which has been appropriately flexible over the past 30 years, a cooperation plan could be a useful process for the Waterton Biosphere Association to communicate the scope of collaborative initiatives it has been formally and informally involved with over the years and to outline the kinds of partnerships it sees for the future. Such a document might also provide a communication tool for the national park to involve local people in the WBA as volunteers and increase the logistic support for the biosphere reserve (research, monitoring, education and training) and build capacity for regional sustainability beyond the biosphere reserve boundaries.

(ii) Budget and staff support including approximate average annual amounts (or range from year-to-year); main sources of funds; special capital funds (if applicable); number of full and/or part-time staff; in-kind contribution of staff, facilities or equipment; volunteer contributions of time or other support.

Parks Canada has provided \$5000 per year (on average) to help cover expenses of the WBA. This has been decreasing each year and is now about \$1500 per year. Other funds are tied to particular projects, such as the cumulative effects study. The annual budget of the WBA has been in the order of from \$7000 to \$10,000 per year not counting the contributions in kind it receives from the 36 staff at the national park and from other organizations, students and volunteers. There are no full-time staff *per se*. The work is carried out by volunteers, and by contractors or permanent staff in other organizations working on projects initiated or supported by the WBA.

(iii) The biosphere reserve's communications strategy including different approaches and tools geared towards the community and/or towards soliciting outside support.

The biosphere reserve has played strategic roles in particular initiatives, such as the NCC Front Range initiative, sponsoring studies such as the Chief Mountain Cumulative Effects study and the Southern Foothills Study presentations, and participating at a wide range of public forums. A

stakeholder groups. Signatories of the nomination form (e.g., managers of core and buffer areas) have a moral, but not a legal, authority to pursue the objectives of the biosphere reserve (Birtch, pers comm., 2007).

new communication strategy using the local newspaper to remind people what the biosphere concept is about and to introduce new residents to the area to the concept is proposed for 2008.

(iv) Strategies for fostering networks of cooperation in the biosphere reserve that serve as connections (“bridging”) among diverse groups in different sectors of the community (e.g. groups devoted to agricultural issues, local economic development, tourism, conservation of ecosystems, research and monitoring).

The WBA fosters networks of cooperation in the biosphere reserve through the involvement of its volunteers in other networks. Current examples include: Waterton Lakes National Park Advisory Board; the Crown of the Continent Managers Partnership, the Southern Alberta Sustainable Community Initiatives (e.g., the Foothills Restoration Forum), and the NCC’s Waterton Front Range Advisory Group.

The WBA volunteers have also been founding members of the Southern Alberta Land Trust Society (SALTS), the Chinook Landowners’ Association, and the Diamond Willow Organic Beef Producers. This involvement is combined with collaborative initiatives with other organizations related to agriculture, economic development, conservation and education. The WBA has met with a small group of stakeholders to explore possibilities for renewing its own organizational structure and function in a larger southwestern Alberta region (including the Municipal Districts of Pincher Creek and Cardston County).

(v) Particular vision and approaches adopted for addressing the socio-cultural context and role of a biosphere reserve (e.g. promotion of local heritage resources, history, cultural and cross-cultural learning opportunities; cooperation with First Nations groups; reaching out to recent immigrant groups, etc.).

Several events are held in partnership with the Waterton Biosphere Reserve, including a Science and History Symposium held in Waterton Park and Glacier Park in alternate years, to communicate research to the public, and this symposium may be brought to the town of Twin Butte in the future. The Land Care education program is presented for elementary school children and college students from communities and First Nations in the region. The Southern Alberta Land Trust Society, for example, highlights the need to integrate conservation and

economic values with the social and cultural values associated with a century of ranching in Waterton.

The Southern Alberta Sustainable Community Initiatives (SASCI) group is undertaking a “values assessment” in the area while the Municipal District of Pincher Creek has begun their latest sustainability planning process. These are possible venues to share discussions about the role of the biosphere reserve, the results of the cumulative effects study, and the value of natural capital (or the “ecological goods and services” in Waterton including clean air, scenic landscapes, indigenous knowledge, and sustainable lifestyles).

(vi) Obstacles encountered by the biosphere reserve or challenges to its effective action.

As noted above in section 1(e), Waterton Biosphere Reserve faces some unique challenges and opportunities. The Waterton Biosphere Reserve was designated in 1979 during the first years of the Man and the Biosphere Programme and before the Seville Conference in 1995. The original nomination of the WBR was not driven by community interests, but rather was largely a result of an application by Parks Canada. As such, it has been difficult to achieve significant community involvement.

The WBA recognizes that more local involvement in its activities would be desirable. Local support and interest varies considerably with the particular issues brought forth at seminars or public forums. There is hope that the collaborative efforts now underway with both the Chief Mountain Cumulative Effects Study and the Crown of the Continent Ecosystem Health Indicators will allow problems and opportunities to be demonstrated more powerfully and convincingly to the general public and politicians.

Local and regional challenges facing the Waterton Biosphere Reserve are: a sparse rural population, young people moving out of the area, a group of people that have been active in the same organizations over long periods of time, lack of financial or staff resources, and the lack of an individual or small group that can champion a new vision for something like a Waterton Biosphere Network and build capacity with new members.

Key opportunities for the WBR are the long-term involvement of some members which provides continuity and organizational memory, the strong support of the national park to reassess the biosphere reserve's needs and possible roles, new people moving into the area, and the interest of other key organizations that might provide new leadership. A combination of education, outreach, and public dialogue might help to redefine and revitalize the Waterton Biosphere Association or create a new organization and structure. These changes are still to be determined. The occasion of this periodic review has stimulated further local discussions on these questions.

(vii) Other.

2d. Comment on the following matters of special interest in the experience of the Canadian network as it relates to this biosphere reserve. Refer to other Sections below where appropriate.

(i) Effectiveness of management plans of government agencies and other organizations in the biosphere reserve. Brief note about plans that have been completed or revised in the past 10 years.

[1] Core Area

Waterton Lakes National Park Management Plan (2000)
Subsequent Management Plan Reviews (2008)
State of the Park Reports (on Ecological Integrity every 5 years)

[2] Municipal

District of Pincher Creek (No. 9) Municipal Development Plan (2002).

The goals of this plan is to “protect and conserve agricultural land for agricultural use to the fullest extent possible without unduly restricting compatible economic diversification or development while respecting the natural environment.”

District of Cardston County (No. 6) Municipal Development Plan (1999) Under Review.
The Town of Pincher Creek is preparing a “Municipal Sustainability Plan,” which will provide a vision for a sustainable Pincher Creek for the next 20-plus years, and identify the actions and tools to help get there.

“Creating a shared vision for our community depends on your input, and that of citizens of Pincher Creek and the surrounding areas, from all ages and walks of life. As the first step in creating a vision for Pincher Creek we need to know and understand our

community values, identify characteristics we want our community to have in the future, and discuss ways we can improve our community. To do this, we will be asking questions about the current reality, the future (success), and how we get to that future” (Pincher Creek, 2008).

[3] Regional

Southwest Alberta Sustainability Initiative (2007): to provide information and education and to facilitate public cooperation through a multi-stakeholder group for the sustainable economic, environmental and social future of southwestern Alberta and its publics.

Castle-Crown-Wilderness Coalition. Bringing it Back: A restoration framework for the Castle wilderness. Prepared by Sheppard et al. (2002).

The Southern Foothills Study. Southern Alberta Land Trust Society (2006).

This study creates a base of data on cumulative land use trends within a large region of southwestern Alberta and includes portions of 10 municipal districts. The study provides government and local stakeholders with information and a tool to investigate the potential impact of both current practices and a range of possible future scenarios.

The Chief Mountain Cumulative Effects Study. Southern Alberta Land Trust Society (2008).

Building from the Southern Foothills Study, and using the same simulation modeling technology for projecting trends, the Chief Mountain Study is a grassroots driven study directed by a multi-stakeholder, consensus-based working group that includes government, industry, First Nations, landowners, NGO’s (including the Waterton Biosphere Association) and Parks Canada. The study arose from local concern about land-use trends and their associated long-term impacts on landscape level indicators such as groundwater stocks, surface water quality, grizzly bear, and native grasslands.

The study area is located in the southwestern portion of Alberta including: Cardston County, the Municipal District of Pincher Creek, the Kainai and Piikani First Nations’ reserves and Waterton National Park. The area covers roughly 925,000 hectares (2.28 million acres) and is predominantly cultivated agriculture (43% of study area), native origin grasslands (30% of study area) and forests (18% of study area). Human footprint currently covers about 2% of the study area. Available online: <http://www.salts-landtrust.org/cms/>

[4] Provincial

Government of Alberta. The Southern Alberta Sustainability Strategy (2006).

This document appraises the current state of the region, identify a vision, goals and principles for sustainable development, make policy recommendations and identify the key issues that need to be addressed and in what order of priority.

Government of Alberta (Alberta Energy, Alberta Environment and Alberta Sustainable Resource Development). Commitment to Sustainable Resource and Environmental Management Document (2006).

An inter-departmental approach that includes: a land use framework, upstream oil and gas, and an information sharing initiative.

Government of Alberta. Water for Life: Alberta's Strategy for Sustainability (2003).

A provincial water strategy outlining recommendations on managing Alberta's water needs, maintaining the provinces economic prosperity, and addressing environmental concerns.

Government of Alberta. C5 Forest Management Unit Management Plan. Department of Sustainable Resource Development (2002).

Government of British Columbia. Kootenay District: Management Direction Statement for Akamina-Kishinena Provincial Park (1999).

Adjacent to Waterton Lakes National Park is the Akamina-Kishinena Provincial Park, a 10,921 ha wilderness class park in southern British Columbia, which effectively adds to the 'core' areas of the biosphere reserve.

Government of British Columbia. The Southern Rocky Mountain Management Plan. Department of Sustainable Resource Management (2002).

[5] Transboundary & Multi-Stakeholder

Crown Managers Partnership Strategic Plan. Prepared by the Miistakis Institute (Draft, 2006).

The Strategic Framework for the CMP presents a vision, focus areas, and goals and objectives for the agencies involved in the Crown of the Continent Ecosystem. With regard to the Crown Managers Partnership, Grant and Quinn (2007) recently stated that: formalizing the existing partnership, exploring options for expanding participation in the partnership to include non-government interests, engaging third party facilitation, using non-traditional data sources, applying metapopulation ecology theory, and interdisciplinary problem solving are all elements recommended for improved transboundary management and of wildlife in the Crown of the Continent Ecosystem.

(ii) Continued local involvement of the work of a biosphere reserve.

The Waterton Biosphere Association is currently in transition. It has continued to exist over the past decade through the commitment of a small group of ranchers and park staff. The WBA has been both strategic and opportunistic in its investments over this period, given limited fiscal resources and volunteer capacity. Early contributions and benefits of the WBA from the 1980s have been previously documented (Cowley and Lieff, 1984; Lieff, 1985; Birtch, 1988; Dolan and Frith, 2003). Since the 1997 periodic review several notable achievements include:

[1] Conservation of private lands: production of a short video in 1997 called “The Waterton Park Front: a Legacy in Peril” illustrating the long-term relationship between the National Park and the ranching community.⁵ The purpose of the video was to frame the future challenges of resource extraction and residential development in the region. It, and a slide show illustrating the fragmentation of ranchland from 1940-2000 in terms of the pressure for residential subdivisions around Calgary, supported the Nature Conservancy of Canada’s initial fundraising program to donors and other foundations (1997-2004) and supported the securement of private lands for conservation.

[2] Control of non-native vegetation: a community-based management and education program to control non-native species in the biosphere reserve in cooperation with various management agencies. More recent ‘weed pulls’ with community groups and First Nations have been held (1998 – present).

[3] Regional eco-tourism: exploring the economic benefits to the regional communities by attracting visitors to the national park into the larger biosphere reserve. A certification (branding) program was proposed to highlight those initiatives and operators which were consistent with the biosphere objectives (1999).

[4] Community Based Ecological Monitoring in partnership with the Ecological Monitoring and Assessment Network (EMAN) in facilitating community based monitoring in the communities of Pincher Creek and Brocket in the Piikani First Nation (2002-2003).

⁵ The Waterton Biosphere Reserve video “Waterton Park Front: A Legacy in Peril” was produced in partnership with Waterton Lakes National Park in 1997. It is available on VHS.

[5] Chief Mountain Cumulative Effects Study: see description on page 20.

(iii) Appropriateness of the current zonations.

The core area of the Waterton Biosphere Reserve is appropriate because the Waterton Lakes National Park constitutes a legally protected area and is of a sufficient size to meet the objectives of biodiversity conservation, sustainable use, research and monitoring. The biosphere reserve is far too small to maintain viable populations of large carnivores such as grizzly bears and mountain lions over the long term. Therefore, the WBR represents one link in a much larger bioregional 'Crown of the Continent' wildlife corridor.

The small portions within the national park with motorized access represent the buffer zone. Adjacent private lands to the north and east of the park could be considered transition areas (including the NCC Front Range lands). The Akamina/Kishkemina provincial park in British Columbia to the west could represent either core or buffer area to the WBR. And the Glacier National Park/Biosphere Reserve in the United States joins Waterton's south boundary creating a transboundary protected area geographically. Although they operate separately, there is regular cooperation between the two parks. Waterton and Glacier have been designated as an international Peace Park since 1932. The use of transition ranchlands allows many of the large carnivores to maintain viable populations.

(iv) "Sustainability" as a deliberate guiding theme for programs in the biosphere reserve.

The WBA is a pragmatic organization that focuses on local and regional issues that are linked to long-term integrated sustainability. For example, the sustainability of agriculture and of ranching are both key concerns. The *unsustainability* of resource extraction and residential development has also been a focus for WBA activity. The educational focus of the national park links the biosphere reserve's conservation priorities with surrounding sustainable land use practices. Notably, some oil and gas companies have appropriated the term to refer to the sustainability of the industry, rather than for preservation of community values or ecological integrity. In 2001, during land securement process led by the Nature Conservancy of Canada, the WBA noted that

“we are probably the closest we are going to get to a sustainable ecosystem around the park...where we have ranching communities, large open spaces, considerable areas of native grassland and native horse cover left” (Frith, 2001). Currently, the Municipal District of Pincher Creek is undertaking ‘Sustainability Planning’ which indicates that the concept is also used by certain government agencies.

(v) Particular scientific work linked with national and international programs (e.g. EMAN, EuroMAB, IUCN – World Conservation Union).

The main examples of scientific work in support of other programs are:

- The Global Observation Research Initiative in Alpine Environments (GLORIA) program in adjacent Glacier National Park/Biosphere Reserve
- The Ecological Monitoring and Assessment Network of Environment Canada.
- National and Provincial species at risk recovery plans (e.g., northern leopard frog).

(vi) Issues arising from multiple cross-scale relationships inherent in the social-ecological systems (e.g. forests, marine systems; links of key local corporations to global economy; government activities across different levels of federal, provincial, and local jurisdictions).

As noted in the introduction, the Waterton Biosphere Reserve is nested in a larger ecosystem of continental and global significance. “At the intersection of two countries, two provinces and one state, the Crown of the Continent Ecosystem is the apex of the Rocky Mountains in North America. Its 44,000 square kilometers includes treasured places like Glacier National Park and the Bob Marshall Wilderness Complex in Montana and Waterton Lakes National Park in Alberta (Figure 2). As one of the premier mountain ecoregions of the world it is also an integral part of the much larger mountainous landscape Yellowstone to Yukon” (Crown of the Continent Ecosystem Education Consortium, 2008).

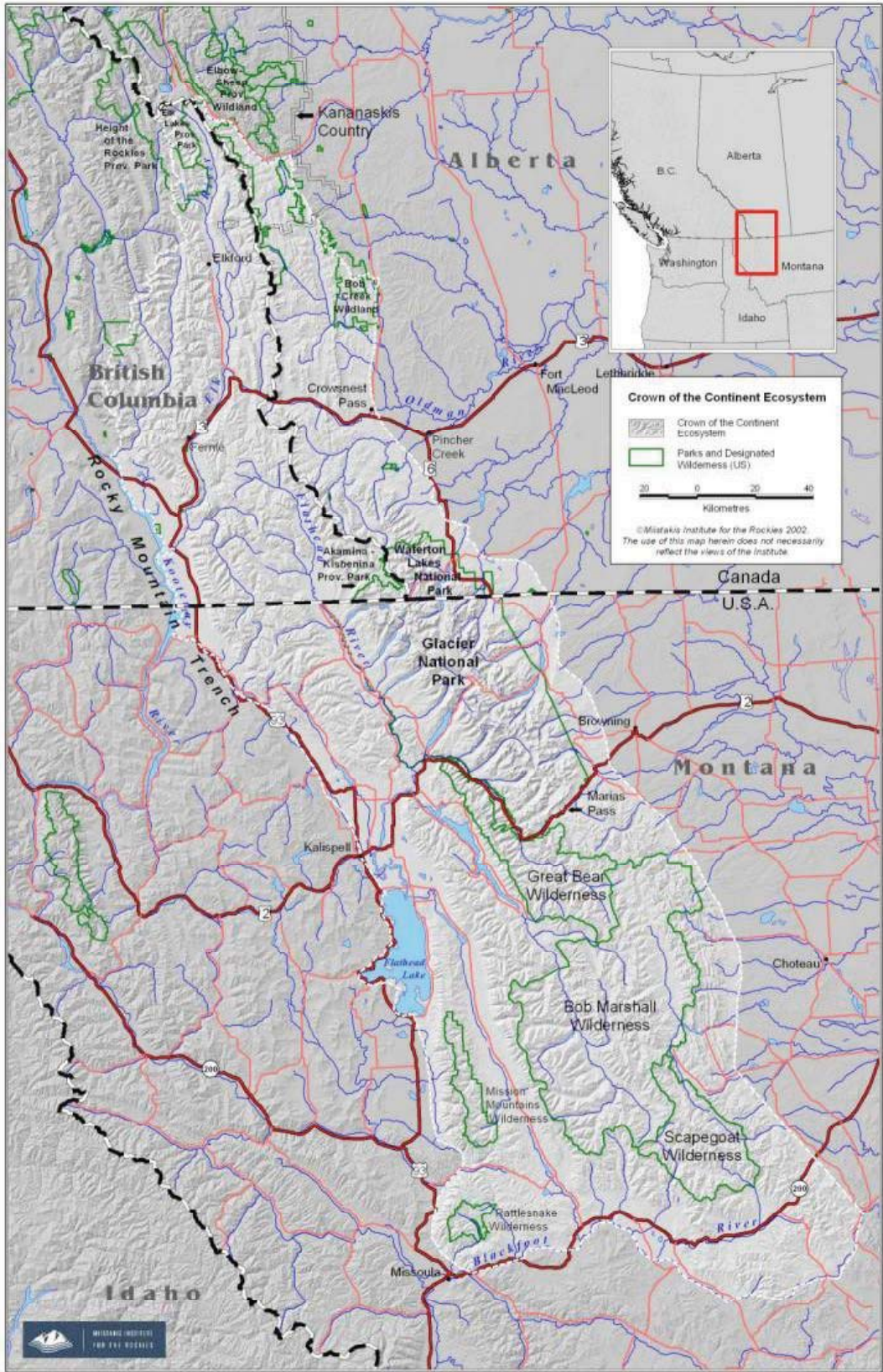


Figure 2. The Crown of the Continent Ecosystem (Miistakis Institute, 2008).

Yet the Crown faces an especially high concentration of development pressures, including: threats to wildlife and critical habitat; uneven distribution of water, land, and energy resources; and social turbulence as economies diversify from a base of natural resource use to knowledge-industry and residential and tourism amenity-oriented growth. People are concerned about changes at the local and sub-regional level that, together, put the larger Crown ecosystem and social fabric at risk” (Crown of the Continent Network, 2008).

The Waterton Biosphere Reserve and the Waterton Biosphere Association (WBA) in particular, has responded to the encroachment of residential development onto traditional rangelands (including large seasonal dwellings, ski resorts, and tourism development proposals); a wave of energy and resource exploration and extraction (including oil wells, sour gas, sweet gas, tight gas and uranium) and the associated complications of air, soil and water contamination; and recent droughts and other impacts of climate change (such as a declining water supply) for agriculture and livestock. The Municipal District of Cardston was declared a “disaster area” due to drought in September 2007.

From a cross-scale perspective, the Waterton Biosphere Reserve is relatively small and the core area of Waterton Lakes National Park is unable to sustain wide-ranging wildlife. Additional challenges include: fragmentation of wildlife habitat outside the park due to development, genetic isolation of endangered species populations, wildfire management, and the spread of invasive species (especially noxious weeds).

Socially and economically, although the region has active and speculative non-renewable resource extraction (e.g., oil, gas, and coal), the area faces rural depopulation, threats to the viability of agriculture and ranching due to water scarcity and global markets, risk of disease (such as BSE in cattle), economic stagnation in rural villages, and social dysfunction associated with loss of livelihoods.

(vii) Strengthening collective capacities for the overall governance of the biosphere reserve (e.g. organization of new networks of cooperation, partnerships).

As noted above in section 2c(iv), the WBA fosters networks of cooperation in the biosphere reserve through the involvement of its volunteers in other networks. Current examples include: Waterton Lakes National Park Advisory Board; the Crown of the Continent Managers Partnership, the Southern Alberta Sustainable Community Initiatives (e.g., the Foothills Restoration Forum), and the NCC's Waterton Front Range Advisory Group. This involvement is combined with collaborative initiatives with other organizations related to agriculture, economic development, conservation and education. The overall governance of Waterton Biosphere Reserve rests with the administrative authority of the core area managers at Waterton Lakes National Park who strongly support broadening the community-based Waterton Biosphere Association.

(viii). Continued justification for a biosphere reserve.

Waterton Biosphere Reserve is one of the oldest in Canada and one of the most impressive. It has received continuous support for its conservation and logistic (e.g., research, monitoring and education) functions from core area managers at the Waterton Lakes National Park. For over 30 years, it has also sustained a dedicated core of volunteers through the Waterton Biosphere Association (WBA) to integrate the conservation of biodiversity with sustainable development (e.g., traditional ranching practices and innovations in organic beef farming). The WBA has made strategic choices about its involvement at critical times on various issues (e.g., brokering private land conservation agreements) and frequently plays the role of providing sound science (e.g., the cumulative effects studies and growth scenarios) for local and regional sustainable development planning. Although buffer areas are largely undefined for the WBR, adjacent protected areas on all sides act as effective buffers to the core. Definition of the transition area has also not been needed to date, and has sometimes been advantageous for engaging community-based organizations (e.g., landowners associations) and municipal governments in the work of the biosphere reserve. The WBA is currently reviewing possibilities for expanded membership in their organization and for possible geographic reconfiguration. As representative of a globally significant ecosystem, and as a critical component of the Crown of the Continent transboundary network, the Waterton Biosphere Reserve certainly merits continued membership in the World Network of Biosphere Reserves.

3. The Conservation Function

(This refers to programs that seek to protect biodiversity at landscape and site levels and/or ecological functions that provide ecosystem goods and services in the biosphere reserve. While actions to address this function might be focussed on core areas and buffer zones, ecosystem dynamics occur across a range of spatial and temporal scales throughout the biosphere reserve and beyond. Note how these cross-scale phenomena are being addressed.)

3a. Significant changes (if any) in the main habitat types identified for the biosphere reserve, including natural processes or events, main human impacts, and/or relevant management practices. (The comparison is with the situation described some ten years ago. Refer to habitat types identified in the section on “Significance for Conservation of Biological Diversity” in the first periodic review form, or ¶ 12 in the nomination document).

Waterton Lakes National Park identifies four ecoregions based on an Ecological Land Classification system (Achuff, McNeil and Coleman, 1997). These constitute the four main types of habitat types: Alpine Ecoregion, Sub-Alpine Ecoregion, Montaine Ecoregion and the Foothills Parkland Ecoregion. The alpine and sub-alpine habitats occur at altitudes of 1,680 and 2,250 m and have no direct human impacts and require no habitat management practices. Notable changes in these two habitat types are with respect to climate change and forest encroachment into the sub-alpine region.

The Montaine ecoregion characterized by coniferous forests experiences some recreational use (such as hiking) and involves controlled/restricted access. The Foothills are a landscape of rough fescue grassland and aspen grove forests that occupy a narrow band along the eastern edge of the foothills of the Rocky Mountains. The main human impacts are recreational use inside the national park and livestock ranching in the adjacent lands. Relevant habitat management practices include controlled/restricted access inside the national park. Lands outside the park continue to be used for livestock grazing, including forage production (hay) for winter feeding.

As noted above, the most significant change to habitat management over the past decade was the conservation initiative by the Nature Conservancy of Canada to secure private lands from residential and recreational development to maintain the Front Range grasslands of the eastern

slopes of the Rocky Mountains. The 14,000 ha area effectively provides a buffer to the north and east of the national park/core area and maintains the traditional ranching activities.

3b. Describe the main conservation programs that have been conducted in the biosphere reserve during the past ten years as well as current on-going ones. Note their main goals and the scope of activities, e.g. biotic inventories, species-at-risk, landscape analyses, conservation stewardship actions. Cross reference with other Sections below where appropriate.

The main focus for conservation of the Waterton Biosphere Reserve, through the national park, is on ecological health indicators. Recent conservation programs within the Waterton Lakes National Park include: the International Peace Park Vegetation Map (2007), an Ecological Classification within the park (2002), and a Land Cover Map for Crown of the Continent and the Foothills Model Forest. Large mammal programs (grizzly, elk, bighorn sheep, bison) are ongoing. All research conducted in the park by staff or visiting researchers must have a valid research permit, which is then entered into a national database. Several examples of studies are listed below; two extensive lists from the Waterton Lakes National Park database is included in Appendices C and D.

Changes in the research focus at the park include more social science (e.g., about visitors, residents, attitudes and social values) and about collaborative initiatives (e.g., the intercept feeding program to reduce grizzly mortality on rangelands⁶). There are more studies on climate change impacts and adaptation strategies (e.g., Letts' gradient of climate stations) and more studies on transboundary wildlife management.

Examples of Core/Buffer Area Conservation Activities:

- Whitebark Pine Ecosystem Restoration
- Southern Western Alberta Arachnida Survey
- Ecological Monitoring Program
- Southern Western Alberta Grizzly Strategy

⁶ For example, elk found dead in winter are dropped from helicopters in the mountains to provide food for grizzlies when they come out of hibernation in the spring so they do not prey on cattle on ranchlands at lower elevations.

- Non-native vegetation management
- Subalpine and Alpine Grasshopper Diversity
- Monitoring Songbird Productivity
- Health and Vigour of Limber Pine
- Cloning in Trembling Aspen
- Butterfly Count
- Landscape Change Seen Through Repeat Photography
- Effects of Introduced Fish on Long-Toed Salamander
- Macro-Invertebrate and Zooplankton Biodiversity
- Effects of Climate Change on Douglas Fir Migration
- Assessing Trends in Whitepark Pine Population Decline

Examples of (Undefined) Transition Area Conservation Activities:

- Grizzly Bear Hair Snagging Study
- Native Thistles in Western Canada
- Tracking Bighorn Sheep
- Spider Survey (2000-present)
- Land Cover Map for Crown of the Continent and the Foothills Model Forest
- Crown Managers Partnership Elk Annual Forum
- Climate Change Impact and Adaptation Group
- University of Victoria Landscape Change Study
- Monitoring Avian Productivity and Survivorship (MAPS)
- International Peace Park Vegetation Map (2007)
- Intercept Feeding to reduce Grizzly Bear mortality
- Non-native vegetation management (e.g., knapweed removal in Cardston County)
- Southwest Alberta Montane Elk study (2007-2011)
- WBA-Miistakis Institute natural capital inventory in the BR area (exploratory phase)

3c. Conservation links to, or integration with, sustainable development issues (e.g. stewardship for conservation on private lands used for other purposes).

The three primary points of integration in the WBR are (1) the conservation, tourism and recreation functions of the Waterton Lakes National Park and (2) the continuation of traditional ranching livelihoods outside the park that support rangeland biodiversity and wildlife habitat. In the previous Periodic Review (Francis, 1997: 21-22) it was noted that the most critical issue facing the WBR was about the growing market for residential and recreational properties on ranch lands adjacent to the national park. However, this issue has been transformed through the conservation agreements and land securement under the Nature Conservancy of Canada and supporting sponsors. (3) The cumulative effects studies, including the South Foothills Study

(north of the biosphere reserve) and the Chief Mountain Cumulative Effects Study (specific to the biosphere reserve and surrounding lands) try to assess the potential impact of development patterns on conservation priorities, and propose alternative scenarios to current growth trajectories.

3d. Other comments/observations from a biosphere reserve perspective.

See section 1e(3) above for the significance of WBR as located in the heart of the Crown of the Continent Ecosystem, at a critical narrow corridor for wildlife migration, and as a founding member of the Crown Managers Partnership.

4. The Sustainable Development Function

(This refers to programs that address sustainability issues at the individual livelihood and community levels, including economic trends in different sectors that drive the need to innovate and/or adapt, the main adaptive strategies being implemented within the biosphere reserve, and initiatives to develop certain sectors such as tourism to compensate for losses in other markets, employment, and community well-being over the past ten years or so).

4a. Briefly describe the prevailing trends over the past decade in each main sector of the economic base of the biosphere reserve, e.g. agriculture, renewable resources, non-renewable resources, manufacturing and construction, tourism and other service industries etc.

Farming and ranching, building and construction, as well as oil and gas and wind energy activities, along with tourism, are integral to the regional economy. There has been growth in all these sectors over the past decade, however, only some of these activities can be considered to be sustainable from a long-term, integrated perspective on their social and environmental impacts. Others, such as farming and ranching, which have the potential to become more sustainable, are vulnerable to the effects of climate change and global economic costs and demands for products.

Agriculture

Nearly half of the labour force in Cardston County is employed in the agricultural sector, which produces: wheat, barley, alfalfa, vegetables, and greenhouse products. Ranching has also

diversified in Cardston County. With more than 100, 000 head of cattle, the ranchers also reflect the growing market demand for other types of livestock, including: pigs, sheep and lamb, buffalo, and poultry. Equine breeding is also a growing industry in Cardston County, with more than 2,700 horses and ponies bred in the area. Agriculture is also at the center of Pincher Creek's economy. "It boasts a booming cattle industry along with a diverse group of rural enterprises who have adopted a pro-active approach to the agri-business industry. This approach embraces the desire to build a sustainable future while maintaining the traditional values of rural lifestyle" (Pincher Creek, 2008).

Oil and Gas

Although the oil and gas sector is still present in the area it has become less important over time as the resource pools become smaller and gas plants downsize and wells are decommissioned. Other developments include seismic surveys to assess resource availability, the continued extraction of sour gas (hydrogen sulfide) as well as sweet gas, and the potential for extracting "tight gas" where the gas doesn't flow well and multiple wells are close together. The re-working of oil and gas fields (to use new technology on small, older wells for lateral drilling) raises concerns about the potential for methane gas leaks into drinking (water) wells. Landowners have also discovered that their land is staked for uranium mining.

Natural Gas

The natural gas industry plays a key role in the economic strength of Pincher Creek. In particular, Shell Canada Waterton sour natural gas processing plant, located south of Pincher Creek, is one of the major employers in the area.

Wind Energy

Canada's wind energy development is concentrated in Alberta, due to electricity deregulation policies (1996) and favourable wind conditions due to the rapid topographic shift from mountains to grasslands. In 2002, Pincher Creek's Municipal Development Plan (No. 1062-02) committed to encouraging the integration of renewable wind energy with other land uses (i.e., agriculture, tourism and rural development) and commissioned a study to review wind energy policies (Municipal District of Pincher Creek, 2007).

Pincher Creek's Municipal Development Plan is currently under review for policies relating to wind energy development. Specifically, the findings of the review may place limitations on the density of future wind turbine development and determine where in the municipal district WECS will be encouraged. As of 2007, the M.D. approved 329 turbines and has a further application for 160 turbines from 10 development companies. By January 2004, this region contained 133 MW – or 30% - of Canada's total present capacity.

Issues surrounding the wind energy industry include: aesthetics, noise, property values, and environmental impacts on the flora and fauna of the region. Municipal policies exist to mitigate land use conflicts to some extent, including: specification of setbacks from residential areas, high and size restrictions, and density of turbine development. According to the WECS Review, 96% of the community strongly supports wind energy to sustain economic growth. Over the past decade, \$10 million has been invested in the Pincher Creek area with the growth in long-term jobs. Calgary's public transit system purchases this green energy for their C-Trains. Enmax, a major electrical utility company also purchases green power, as do towns and municipalities that are supplied by the Alberta grid.

Tourism

Close proximity to the Rocky Mountains has seen growth in tourism. Attractions include: mountain recreation, wildlife viewing, camping, hunting and fishing (e.g., Crowsnest River), snowmobiling and cross-country skiing, as well as Castle Mountain Ski Resort. Major attractions include: Waterton Lakes National Park, Going to the Sun Road, and Glacier National Park. According to the town of Pincher Creek (2008), tourism is the fastest growing industry: "Home to a rich history and nestled in stunning natural beauty, Pincher Creek offers tourists an exciting year-round travel destination. Museums, cultural centers, bed and breakfasts, guest ranches, and guiding and outfitting businesses are prospering in this thriving tourist area."

4b. Community economic development initiatives. Programs to promote comprehensive strategies for economic innovation, change, and adaptation, and the extent to which they are being implemented within the biosphere reserve. Local business or other economic development initiatives. Are there specific "green" alternatives being

undertaken to address sustainability issues? Relationships (if any) among these different activities.

[1] The Southwest Alberta Sustainable Community Initiative (SASCI) is a non-profit society and it includes all stakeholders in the Pincher Creek area. The concept was developed through the Chamber of Economic Development, following a general forum with 90 stakeholders in 2002. Over the years 70% of funding has come from industry, with additional funds from the town and Municipal District of Pincher Creek. Its goal is to facilitate research and public information to help guide sustainable development decisions. The SASCI background document (January 2007) provides a history of activities to illustrate the breadth of work it undertakes for sustainability.

[2] Native (grassland) range management has slowly improved around Waterton; however, the outbreak of BSE (or “mad cow” disease) in 2003 resulted in a ban on exporting beef to the U.S. and Mexico. Local ranchers were forced to sell for less in Canada or maintain and expand their herds, which has since put increased pressure on range quality. The WBA has actively supported the Alberta Organic Producers Association and experiments with small organic beef cooperatives, such as Diamond Willow Producers Ltd. The Diamond Willow collaborative is made up of seven certified organic ranching families in Western Canada. “The families of Diamond Willow are acutely aware and supportive of the need for sustainable ranching within an ecologically-sensitive framework. This is the wisdom and ethic that brought us to produce certified organic beef as a natural complement to the ancient grasslands we strive to protect” (Diamond Willow Beef, 2008).

[3] The Crown of the Continent Geotourism MapGuide Stewardship Council was created in 2006 to advise National Geographic during the development of the Crown of the Continent MapGuide. It includes community leaders, public land managers, food and hospitality sectors, native peoples, conservation and civic groups, landowner groups, historic preservation societies, artisans and artists, eco-tour operators, and others who support geotourism principles. The role of the stewardship council is evolving and expected to oversee the dynamic MapGuide web site and printed MapGuide, promote sustainable tourism practices, educate local communities and new residents about the Crown of the Continent, and support place-based stewardship initiatives.

[4] The Alberta Farm Recovery Plan (AFRP) will address the economic strain that Alberta producers are facing attributed to Canada's rising dollar, the drop in livestock prices, and high feed prices - spurred on by the demand for biofuels in the US. In addition, producers are suffering as a result of excess moisture and continued high fuel and fertilizer costs. AgriStability, together with AgriInvest, will replace the coverage previously provided under the Canadian Agricultural Income Stabilization (CAIS) program.

4c. Community support facilities and services. Programs in/for the biosphere reserve that address issues such as job preparation and skills training, health and social services, and social justice questions. Relations among them and with community economic development.

Social Services

The Pincher Creek and District Family and Community Support Services facilitates a number of preventative social services and community initiatives which contribute to quality of life and family wellness. FCSS is a joint municipal-provincial funding program that supported in 2008:

- Canadian Mental Health - Coping and Caring
- Canadian Mental Health – Community Links
- Canyon Kids Preschool
- Family School Liaison Worker Project – Livingstone Range School
- Family School Liaison Worker Project – St. Michael's School
- Pincher Creek Handi Bus Society
- Pincher Creek Play Group
- Pincher Care Bear Society
- Women's Emergency Shelter Association
- Youth Employment Services

Arts and Culture

- Pincher Creek Municipal Library
- Pioneer Place and Kootenai Brown Village
- Pincher Creek At Heritage Acres
- The Lebel Mansion

Events and Festivals

- Cultural Concert Series
- Cowboy Poetry Gathering
- Children of the Wind Kite Festival

- Pincher Creek Fair and Rodeo
- Huckleberry Festival

Recreation, Fitness and Trails

- The Pincher Creek Multi-Purpose Facility
- The Memorial Community Center Arena
- Town Hall Facilities
- School Facilities
- Community Hall
- Pincher Creek Curling Rink
- Community Recreation Centre
- Adopt-a-Trail Program
- Communities in Bloom
- Pincher Creek Hospital
- Windy Slopes Health Foundation

4d. Other comments/observations on development from a biosphere reserve perspective.

5. The Logistics Function

(This refers to programs that enhance the collective capacity of people and organizations in the biosphere reserve to address conservation and development issues. Much of it may be directed towards the research, monitoring, demonstration projects, education and training that are needed to deal with the specific circumstances of the biosphere reserve. To be effective they should be open to learning and the exchange of experience with other biosphere reserves and international programs of cooperation).

5a. Describe the main research institutions in the biosphere reserve, or conducting work in the biosphere reserve, and their programs.

Research Institutes

[1] Miistakis Institute

Miistakis is a non-profit corporation affiliated with the University of Calgary that undertakes and supports pure and applied research respecting the ecosystems of the Rocky Mountains and surrounding regions. Miistakis implements these programs through an affiliation with the University of Calgary and in close partnership with federal and provincial/state agencies, landowners, First Nations, conservation organizations and industry. They provide the Secretariat for the Crown Managers Partnership. Research programs reflect core conservation issues in the Crown:

- Facilitation of ecosystem-based research in the Crown of the Continent
- Transboundary Geospatial Analysis and Research
- Creation of tools to disseminate spatial and biological information to a wide audience.

[2] Rocky Mountain Cooperative Ecosystem Studies Unit

Based at the College of Forestry and Conservation at the University of Montana, the mission of the Rocky Mountains Cooperative Ecosystem Studies Unit is to improve the scientific base for managing ecosystems in the rapidly changing social, cultural, and environmental landscape of the Rocky Mountain Region, and to extend its expertise to national issues where appropriate.

- Provide research, technical assistance and education to federal land management, environmental and research agencies and their potential partners
- Develop a program of research, technical assistance, and education that involves the biological, physical, social, and cultural sciences needed to address resources issues and interdisciplinary problem-solving at multiple scales and in an ecosystem context
- Place special emphasis on the working collaboration among federal agencies and universities and their related partner institutions.

[3] Crown of the Continent Research Learning Centre

Based at Glacier National Park in Montana, the goals of the CCRLC are to: (1) link management decisions more closely with scientific research results and (2) to build integrated knowledge sharing relationships with educational institutions and the public. CCRLC projects are developed within this context and are carried out through collaboration among government, academia, educational institutions, public interest, and private citizens, all of whom are committed to understanding and preserving the Crown's natural, social, and cultural heritage.

[4] Lincoln Institute of Land Policy Studies

The Lincoln Institute of Land Policy conducts research and policy evaluations, holds conferences, provides education and training, supports demonstration projects, and publishes books and reports on policy issues relating to land. The Institute seeks to improve the quality of public debate and decisions in the use, regulation, and taxation of land by integrating theory and practice, and providing a nonpartisan forum for the discussion of related issues.

[5] The Chinook Institute for Community Stewardship

The Chinook Institute is a charitable non-profit organization that helps people become more sustainable in their use and management of Western Canada's natural landscapes. CI assists growing communities to plan for and manage change in ways that protect the important natural and cultural assets of a place; and supports local initiatives that promote responsible use, stewardship and conservation of natural landscapes. Our approach involves collaborative, values-based planning – building community and land use plans based on the expressed values and interests of local residents – and puts resources and tools into the hands of community members.

[6] The National Parks Conservation Association

Its mission is to protect and enhance America's National Parks for present and future generations. NPCA has taken a leadership role in the Crown of the Continent MapGuide Project, providing the Project Manager staff for the National Geographic MapGuide Project and Stewardship Council.

[7] The Public Policy Research Institute

An applied research and education center at The University of Montana, the institute promotes sustainable communities and landscapes through collaborative governance, which includes citizen participation, deliberative democracy, multi-party negotiation, community-based collaboration, cooperative conservation, joint fact finding, and consensus building. The research institute supports regional stewardship activities in the Crown through workshops/conferences and facilitated meetings of stakeholders.

[8] Crown of the Continent Ecosystem Education Consortium (COCEEC)

This was founded in 1995 to bring a bioregional focus to education in the Crown of the Continent. This group of educators and representatives of agencies and private organizations meet semi-annually and represent the ecosystem from Waterton and Castle-Crown region in southern Alberta, Canada to Missoula, Montana. COCEEC has been active in supporting ecosystem-focused curriculum, workshops, and projects.

[9] Alliance for Regional Stewardship (ARS)

An online resource helps community leaders through a learning network, advisory services and action research. They produced a “Guide to Successful Local Government Collaborations in America’s Regions” and “A Blueprint for Achieving Regional Results.”

[10] Crown of the Continent Network

With over 170 supporting agencies and organizations, this network’s working definition of "regional stewardship" is public-private partnerships efforts that are fostering a healthy environment, livable communities, and vibrant economies in the Crown of the Continent. Examples of stewardship include:

- Private Landowners are conserving large acres from future development by working with Land Trusts to place their lands in perpetual conservation easements.
- Watershed Groups are Improving Water Quality by Restoring Streams in the Crown
- Wildlife Partnerships are Cataloging and Conserving Wildlife Habitat in the Crown
- Local Government are Engaged in Land Use Planning in the Crown
- Coalition Secures Permanent Retirement of Federal Energy Leases on the Rocky Mountain Front

Note: A list of research undertaken in Waterton Lakes National Park is in Appendices C and D.

5b. Environmental/sustainability education. Note the main educational institutions (“formal” – schools, colleges, universities, and “informal” – services for the general public) in the biosphere reserve, or conducting work in the biosphere reserve. Describe their programs, including special school or adult education programs, as these contribute towards the functions of a biosphere reserve. Comment on organizational changes (if any) in institutions and programs that were identified in the biosphere reserve ten or so years ago (e.g. closed down, redesigned, new initiatives). Note programs of UNESCO Associated Schools where applicable, and contributions towards the UN Decade of Education for Sustainable Development (2005-2014).

[1] Educational Institutions

University of Alberta
University of Calgary
University of Lethbridge
University of Saskatchewan
University of Victoria
University of Montana
University of Oregon State
And other visiting national and international researchers.

[2] Educational Programs

The Waterton Biosphere Association is involved primarily with education through the national park’s Land Care program for the grade 7 curriculum (“Ecosystems and Interactions”) and adapted presentations on protected areas management for University of Lethbridge and college students. This program is offered seven times a year and teaches land use management from the multiple perspectives of First Nations, ranchers, and park managers. The Science Alberta Foundation has been a partner for grade 9 biodiversity curriculum. Students from the Blood and Piikani First Nations also attend the park programs and elders from these communities participate in a storytelling program at the park each summer.

The Waterton Biosphere Association supports the international Waterton-Glacier Writers’ Workshop held biannually in Waterton park. The Science and History Symposium is held in Waterton Park and Glacier Park in alternate years, to communicate research to the public. The

Land Care education program, as noted above, is presented for elementary school children and college students from communities and First Nations in the region.

WBR also hosts the University Transboundary Internship Program for the universities of Montana and Calgary in support of this graduate program. Students from both countries are placed in graduate internships which focus on transboundary issues and initiatives. The WBR works closely with the Miistaskis Institute at the University of Calgary.

The Crown of the Continent Environmental Education Consortium (COCEEC) was established in 1995 to bring a bioregional focus to education across Alberta and Montana. Some of the educational products include a *Map Without Boundaries* and an educational resource guide for schools, entitled the *Crown of the Continent Ecosystem: Profile of a Treasured Landscape*. The Waterton Lakes National Park is a member of COCEEC which supports the Waterton Natural History Association, special courses and guest speakers.

As part of its continuing mandate, and as pointed out in the previous Periodic Review (Francis, 1997: 29), “The national park maintains a communications program for visitors and local residents, on matters pertaining more closely to park management. Staff have encountered some confusion among visitors about the different international designations (International Peace Park, Biosphere Reserve, and World Heritage Site) which some people assume to be three additional layers of bureaucracy. In response, staff point to the need to transcend boundaries in order to deal with issues such as wildlife conservation, and this is reported to be more understandable to the public than descriptions of conceptual difference among the designations.”

5c. Other comments/observations from a biosphere reserve perspective.

Members of the Waterton Biosphere Association would add that for a number of years now all the water in the Oldman River System has been allocated. No new water licences are being issued. The Chief Mountain Cumulative Effects Study identified that the ground water in the area is also declining which will become a *determining factor* in how south western Alberta evolves in the future.

The Alberta Energy Resources Conservation Board has recognized these cumulative effects studies for use as information and evidence in its hearings. The new Alberta Land Use Framework, now released in draft form will also use these studies.

Finally, a public meeting is scheduled for June 5, 2008 to discuss the removal of an unused dam on Drywood Creek. Removal of this dam would open up fish migration in over 30 km of waterways.

6. Governance and “civil society” context for the biosphere reserve.

(Local biosphere reserve groups have to work within extensive overlays of government bodies, business enterprises, and a “civil society” mix of non-government organizations and community groups. These collectively constitute the structures of governance for the area of the biosphere reserve at any given time. Success in carrying out the functions of a biosphere reserve can be crucially dependent upon the kinds of collaborative arrangements that evolve among sets of these other organizations. A key role for the local biosphere reserve group is to learn about the governance system they are in and explore ways to enhance its collective capacities for fulfilling the functions of a biosphere reserve.)

6a. What is the overall framework for governance in the area of the biosphere reserve? *Identify the main components and their contributions to the biosphere reserve. List in a separate Appendix if necessary. Components include:*

(i) local jurisdictions (townships/districts, First Nations communities, towns and cities).

Municipal District of Pincher Creek
Municipal District of Cardston
Blood Tribe
Peikani First Nation
Pincher Creek
Cardston
Twin Butte
Mountain View
Waterton Lakes

(ii) government agencies and programs (federal, provincial, regional sub-provincial, local) that relate to, and may become involved in, the functions of a biosphere reserve.

[1] Federal

Agriculture and Agri-Food Canada
Atomic Energy of Canada Ltd.
Commissioner of the Environment and Sustainable Development
Canadian Food Inspection Agency
Canadian Grain Commission
Canadian Heritage
Department of Foreign Affairs and Trade
Environment Canada
Farm Credit Canada
Foreign Affairs and International Trade
Health Canada
Human Resources and Social Development
Indian and Northern Affairs
Industry Canada
Infrastructure Canada
National Energy Board
National Farm Products Council
National Round Table on the Environment and the Economy
Natural Resources Canada
Parks Canada
Species at Risk Act Public Registry
Transport Canada
Western Economic Diversification Canada

[2] Provincial

Aboriginal Relations
Advanced Education and Technology
Agriculture and Rural Development
Children and Youth Services
Culture and Community Spirit
Education
Employment and Immigration
Energy
Environment
 The Water Act
 The Environmental Protection and Enhancement Act
 The Environmental Assessment Process
Finance and Enterprise
Health and Wellness
Housing and Urban Affairs
Infrastructure
International and Intergovernmental Relations
Municipal Affairs
Seniors and Community Supports

Sustainable Resource Development
Tourism, Parks and Recreation
Transportation

[3] Regional-Sub-Provincial (Southern Alberta Multi-Stakeholder Initiatives in the CoC region)

Alberta Low Impact Development Partnership
Apportionment of the St. Mary and Milk River between Canada/U.S.
Bow River Basin Council
Calgary Regional Airshed Zone
Elbow River Watershed Partnership
Highwood River Public Advisory Committee
Milk River Watershed Council Canada
Nose Creek Watershed Partnership
Oldman Watershed Council
Prairie Conservation Forum
Riparian Land Conservation and Management Project
Southwest Alberta Sustainable Community Initiative
The Crown Managers Partnership (CMP)⁷

(iii) key businesses and industry sectors (main employers)

Agriculture/Ranching
Construction/Housing Development
Oil and Gas
Renewable Energy
Small business/Manufacturing
Social Services (Education/Health)
Tourism/Recreation

There are a significant number of people who reside in the area but commute to jobs elsewhere in the province, across Canada, and internationally. There are also a growing number of people who are self-employed, running home businesses or subcontracting work through the Internet, as well as artists, authors and others.

(iv) main non-governmental organizations in the CoC region (an asterisk (*) indicates those active in the biosphere reserve).

Alberta Conservation Association
Alberta Stewardship Network

⁷ The Crown Managers Partnership (CMP), started in 2001, is a voluntary network of 21 participating agencies including representatives from the provinces of Alberta and British Columbia, the state of Montana, federal governments, and First Nations. They work together to coordinate management across jurisdictions to maintain a healthy ecosystem in the Crown. Participants work to build awareness of common interests and issues, shape relationships, and identify collaborative tasks for the future.

Alberta Wilderness Association*
Beef Information Centre
Bow Riverkeepers
Canadian Cattlemen's Association
Canadian Parks and Wildlife Society*
Chinook Landowners Group*
Citizens Concerned about Coal Bed Methane (Bulkley Valley, BC)
Cows and Fish: Alberta Riparian Habitat Management Society
Crown of the Continent Network*
Diamond Willow Organic Beef*
Earthwatch Institute
Ferne Citizens Concerned about Coalbed Methane (CBM)
Freehold Owners Association
Foothills Restoration Forum*
Land Trust and Conservancy
Livingstone Landowners Group*
Nature Conservancy of Canada*
Northern Plains Resource Council
Oil and Gas Accountability Project
Pekisko Group*
Prairie Conservation Forum*
Range Management
Rocky Mountain Elk Foundation*
Sierra Club of Canada
Society of Range Management
South Porcupine Landowners Group*
Southern Alberta Land Trust Society*
Southwest Alberta Sustainable Community Initiative*
The Elite Farmer
The Organic Center for Education & Promotion
The Quivira Coalition
Upper Green River Valley Coalition
Watersheds of Alberta
Western Sky Land Trust
Waterton Front Advisory Committee*
Waterton Natural History Association*

(v) major collaborative groupings involved with biosphere reserve-related activities (networks, alliances, coalitions, partnerships).

See sections 5a and 6a above for examples of collaborative research, stewardship and management partnerships in the Waterton region and for the Crown of the Continent.

6b. Identify the role of the biosphere reserve organization in these structures, e.g. convenor or co-sponsors of conferences and workshops, leader in networking processes, members of advisory boards, funded project activities, managed projects as a stakeholder in some larger endeavour.

As noted, Waterton Biosphere Reserve is a member of several local, regional, national and transboundary organizations and initiatives through its volunteers in other networks, such as the Waterton Lakes National Park Advisory Board, the Crown of the Continent Managers Partnership and Ecosystem Network, the Shell Canada Resources Round Table, the Prairie Conservation Forum, and others.

WBR continues to take a non-advocacy role (unlike landowner groups and some environmental NGOs) and focus on information, outreach and education (e.g., the cumulative effects studies). One member of the WBA noted that: “our role is to disseminate information, share science, and facilitate the presence of the biosphere reserve as an entity.” As the previous Periodic Review noted (Francis, 1997: 34), the WBR “has always to judge the extent to which it gets involved in ‘management issues,’ especially those which government agencies or the private sector believe are best left to them. This requires a fine balance between advocacy for conservation and sustainable resource use generally, and addressing issues where this is not being done.” The rise of collaborative efforts, new partnerships, and multi-stakeholder and transboundary initiatives in southern Alberta is impressive; the biosphere reserve’s long-standing commitment to integrating conservation and sustainable development is an important part of such a regional movement.

Interviews with WBA members expressed strong concern for the autonomy of individual initiatives and the recognition of governance overlays on the southern Alberta landscape. The activities of the WBA have been very strategic, in terms of what issues, at what times, and what roles the group plays. The WBA has long been a member of the Prairie Conservation Forum - a large voluntary coalition of stakeholder groups whose members are interested in the conservation of native prairie and parkland environments in Alberta. The PCF, which has been in existence for over 16 years, is currently involved in the implementation of the Alberta Prairie Conservation Action Plan (2006-2010) to focus on research, stewardship and education.

Other roles for the WBA are as a liaison (rather than mediator) between park managers in the core area and surrounding residents and ranchers. Involvement of ranchers in biosphere reserve activities, for example, waxes and wanes depending on the issues (e.g., wolf awareness, elk monitoring, bison re-introduction) and their availability as volunteers. Some of the conflicts between groups a decade ago have now faded, and both park managers and the WBA are aware of this opportunity to establish a new structure for the biosphere reserve organization that incorporates new organizations (such as the Nature Conservancy of Canada and the Southwest Alberta Sustainable Community Initiative) and fosters joint initiatives locally and across the two surrounding municipalities. Reconfiguration of the biosphere reserve itself, in terms of delineating buffer and transition areas, is also under discussion.

6c. What have been the main changes in overall governance for the biosphere reserve during the past 10 years? What general experience has the biosphere reserve organization had from fostering collaborative endeavours to enhance the governance capacity in the biosphere reserve. What seemed to work, what didn't?

Over the past decade, the Waterton Biosphere Reserve has experienced very few changes in its governance structure (i.e., the Waterton Biosphere Association supported by the national park). However, awareness of much more complex, cumulative, and cross-boundary issues has emerged through resource development pressures in the region and the Crown of the Continent movement. The Waterton Biosphere Reserve has continued to play a facilitating role in bridging issues that affect the park (core area) and surrounding ranches and residents (roughly a 20 km buffer) and the municipal districts of Cardston and Pincher Creek. Most significantly, the WBR has been instrumental in education and awareness (i.e., video production, land use studies) and in brokering agreements between land managers, ranchers, and conservation organizations. These efforts have spanned the decade but have been highly worthwhile, in terms of landscape protection, conservation of biodiversity, building social trust, and supporting sustainable livelihoods. Prospects for future collaboration, and indeed expansion of the WBA, appear to be positive. As noted above, informal discussions about the revitalization of the biosphere reserve organization, administration and possible re-configuration (e.g., defining transition areas) are underway.

7. Conclusions

Note: This section is from the UNESCO/MAB (first) periodic review form. Provide brief justification of the ways in which the biosphere reserve fulfills each criteria of Article 4 of the Statutory Framework for the World Network of Biosphere Reserves. Refer to other sections of this report if appropriate.

(i) The biosphere reserve should encompass a mosaic of representative ecological systems representative of major biogeographic regions, including a gradation of human interventions.

Yes. The WBR encompasses areas ranging from the mountains to the prairies that are representative of the eastern slopes along a major section of the Rocky Mountains. The absence of extensive foothills that occur elsewhere along the eastern slopes makes the area somewhat unique. There is a marked gradation of human interventions in the grasslands adjacent to the park, as well as wilderness and motorized areas within the park. Research and monitoring across these gradients are especially valuable.

(ii). The biosphere reserve should be significant for biological diversity conservation.

The steep environmental gradients from the Continental Divide to the prairies has created an unusually rich mosaic of habitats with their associated flora and fauna. The resulting species richness is considerably greater than comparable areas of the Rockies to the north.

(iii.) The biosphere reserve should provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale.

WBR has demonstrated sustainable land use in terms of range management at a regional scale. Ongoing opportunities are the reconciliation of wildlife protection with livestock production. Forest fire management and invasive species controls are actively being tested. Private sector initiatives include organic beef production, ecotourism, and conservation land purchases and easements. Contentious new issues about uranium mining or renewable energy and the installation of wind turbines is another area for public discourse.

(iv). The biosphere reserve should have appropriate size to serve the three functions (as set out in Article 3).

The only size limitation of the WBR concerns the maintenance of viable populations of large carnivores. While it contributes to the support of mammals such as grizzly bears, mountain lions and wolverine, the WBR itself is far too small to maintain sufficiently large populations for them to be viable over the long-term. This is also the case with other national parks in the Rockies. This issue is being addressed by initiatives from different agencies involved with Yellowstone to Yukon and the Crown of the Continent Ecosystem. These concepts envision a large regional network of protected areas connected by broad habitat corridors managed in ways to reduce negative impacts on the large animals.

(v). The biosphere reserve should have appropriate zonation to serve the three functions.

Yes. See section 2d (iii) above.

(vi). A biosphere reserve should have organizational arrangements for the involvement and participation of public authorities and local communities in carrying out the functions of a biosphere reserve.

The WBA currently operates informally as a small group of volunteers with a core of some 5-7 people taking the main initiatives. These individuals help to link WBR concerns to other informal networks of people or organizations devoted to particular conservation or resource issues. The main thrust of the WBA has been to promote dialogue and awareness about sustainable land use. The WBA is currently in transition as it seeks to renew its membership and clarify its role amidst the many other organizations involved in conservation, land use and sustainability planning from local to continental scales.

(vii). A biosphere reserve should have:

- a) provisions to manage human use and activities in the buffer zones,
- b) a management policy or plan for the area of the biosphere reserve,
- c) a designated authority or mechanism to implement this policy or plan, and
- d) programmes for research, monitoring, education and training.

The Waterton Lakes National Park management plan (2000) delineates its motorized access zones which make up the buffer areas within the WBR. The 2000 Management Plan guides the policies for the park and for communications and programs with adjacent ranchland owners. The designated authority to implement the national park plan is the WLNP under Parks Canada jurisdiction. Programs for research and monitoring within the park are extensive and are well-documented. Extending research and monitoring across park boundaries (into ranchlands, NCC lands, surrounding municipalities, etc.) is an ongoing project.

(viii) Does the biosphere reserve have cooperative activities with other biosphere reserves (exchanges of information and personnel, joint programmes, etc.)?

At the national level, the WBR is represented in the Canadian Biosphere Reserves Association (incorporated as a non-profit organization in 1998). Through twinning or transboundary biosphere reserves, Waterton works closely with Glacier National Park in Montana through the International Peace Park designation (1932), the World Heritage designation (1995) and the Crown Managers Partnership (ongoing). Within the world network of biosphere reserves, WBR and the WBA continues to provide support to international visits and delegations from China, Inner Mongolia, Thailand and Indonesia.

Obstacles encountered, measures to be taken and, if appropriate, assistance expected from the Secretariat.

Noted above in sections 1(e) and 2(c-vi) and relating to the desire for expanded public involvement, the need for renewed volunteer leadership and financial resources, and the articulation of a unique role and function for the biosphere reserve in the region.

(ix) Main conclusions of the reviewer(s).

As noted above in section 2 (d-viii), the Waterton Biosphere Reserve is one of the oldest in Canada and one of the most impressive. It has received continuous support for its conservation and logistic (e.g., research, monitoring and education) functions from core area managers at the

Waterton Lakes National Park. For over 30 years, it has also sustained a dedicated core of volunteers through the Waterton Biosphere Association (WBA) to integrate the conservation of biodiversity with sustainable development (e.g., traditional ranching practices and innovations in organic beef farming). The WBA has made strategic choices about its involvement at critical times on various issues (e.g., brokering private land conservation agreements) and frequently plays the role of providing sound science (e.g., the cumulative effects studies and growth scenarios) for local and regional sustainable development planning. As representative of a globally significant ecosystem, and a critical component of the Crown of the Continent transboundary network, the Waterton Biosphere Reserve certainly merits continued membership in the World Network of Biosphere Reserves.

(x) Directions to pursue based on the findings from this review.

[1] The Waterton Biosphere Reserve is poised to expand its presence in the region through a revitalization of the Waterton Biosphere Association (WBA). Recent discussions among members have proposed a ‘Biosphere Network’ that brings a wider representation of stakeholders together on various issues relating to conservation and sustainable development. Long supported by the Waterton Lakes National Park, the Waterton Biosphere Association is often perceived as an environmental organization rather than one that seeks to support sustainable livelihoods and build capacity through its logistic functions (education, training, research and monitoring).

The WBA has traditionally been project-focused and invested significant volunteer resources into providing public information, bringing awareness to emerging issues and pressures on the landscape, and providing a support role to other organizations (e.g., the national park, landowners’ groups, university researchers, etc.). Members agree that the WBA has potential to expand its membership, clarify its unique role as a public forum for dialogue, and become an umbrella organization to highlight the work of others. The revitalization of the WBA should avoid duplicating other organizational structures in the region and aim to communicate its unique

role among other players. Possible models include: a Biosphere Roundtable, a Biosphere Network, or a Biosphere Learning Centre.

Building capacity for an expanded organization is the first step. This will involve new people to provide leadership and vision. Funding from local, regional and national sources will be required to sustain the transition and support a local coordinator. A series of newspaper articles on the 30-year history of the biosphere reserve and its accomplishments has been proposed. A public forum to discuss the future of the biosphere reserve's ideal structure and continued purpose has also been proposed for 2008. Through public consultation, the unique role and value of the Waterton Biosphere Reserve can be affirmed and communicated more widely.

Possible roles for the WBR could be as follows: (1) hosting public forums to define regional sustainability criteria for various economic sectors; (2) participating in municipal Sustainability Planning exercises; (3) providing demonstrations of sustainable livelihoods (e.g., demonstration farms for agriculture or organic beef); (4) hosting information sessions on critical issues (e.g., water, climate change, or fescue grass); (5) disseminating research to support land use planning.

[2] Once the WBA has renewed its leadership, membership, vision and purpose, it is recommended that the geographic delineation of the WBR's core-buffer-transition zones be explored for possible reconfiguration. Although the concepts of core and buffer are highly sensitive and sometimes political terms, revised zonation of the WBR could help to conceptualize the Eastern Slopes as a place where environment and economy are integrated through conservation (cores) and surrounding sustainable livelihoods (buffers) within a transition zone or "cooperation area" of the two surrounding municipalities.

Other possibilities for reconfiguration of the WBR include: (1) expansion into the Flathead Basin region of British Columbia to the west; (2) expansion to the Castle Wilderness area to the north; and/or (3) special attention to the Eastern Slopes and the Chief Mountain Cumulative Effects Study area. In any case, the national park core is supported by the newly acquired NCC Front Range lands to the east which effectively act as a buffer zone, and this could be formally recognized in a submission for expansion to UNESCO/MAB.

The scale of the biosphere reserve should reflect a strong sense of place for local people and resource managers. Although any boundary changes to the biosphere reserve may face some challenges, the major advantage of reconfiguration is making the WBR an entity that is distinct from the national park, one that incorporates a broader range of stakeholders, one that is highly supportive of sustainable development, and one that is recognized as a critical node in the Crown of the Continent Ecosystem network.

Inclusion of area municipalities alone, for example, would highlight the role of people in a working landscape, the potential for ‘quality economies’ such as organic beef, and the necessity of cooperative sustainable land use planning – all functions of a world biosphere reserve. Both the revitalization of the WBA and the possible reconfiguration of the WBR will draw support and lessons from other biosphere reserves in Canada and in the World Network, and provide a learning platform to help older biosphere reserves adapt and evolve. Since the issues of biodiversity conservation and sustainable development in Waterton are still of critical concern, and the pressures on maintaining a functional landscape have only increased over the past decade, the Waterton Biosphere Reserve is needed as a framework for involving people in the integration of the region’s environment, culture and economy, now and for future generations.

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Rebecca M. Pollock, Vice-President
Canadian Biosphere Reserves Association
Georgian Bay Littoral Biosphere Reserve

and

Valerie Pankratz, Treasurer
Canadian Biosphere Reserves Association
Riding Mountain Biosphere Reserve

Reviewers on behalf of the Canadian Biosphere Reserves Association for submission to
the Canadian Commission for UNESCO.

September 30, 2008.

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Appendix A. Map of Waterton Biosphere Reserve.

The WBR has to now assess whether its original flexible boundaries (approximately 20 km surrounding the park to the north and east) should be formally delineated on a map to include the Waterton Front Range a Zone of Cooperation for the biosphere reserve, as illustrated below.



Appendix B. Common indicators and associated measures for Montane Cordillera Bioregion – June, 2006

Indicator	Measure ⁸	Draft Description	Draft or Example Question
Terrestrial Ecosystem Condition	1. Areal extent of human footprint (terrestrial impact)	Buffering all human influences using GIS layers, based on ecosites (results = which ecosites are most impacted based on rarity), change width and coefficient effect of feature, done in Jasper NP for the rare ecosites in the montane	Is the area of impact of human influences / infrastructure / dispersal of people from nodes, on habitats (ecosites & perhaps rare ecosites) not changing over time, in the park? (And each park would have specific rare habitat / species)?
	2. Non-Native Plants (terrestrial impact)		
	3. Exotic pathogens (terrestrial impact) (e.g. white pine blister rust / hemlock looper / spruce budworm)	Monitoring of exotic pathogens	Is the rate of blister rust infection changing by more than 20% every 10 years, in the park?
	4. Soil nutrients and physical properties	Monitoring of soil nutrients and physical properties	Are priority soil nutrients and physical properties changing significantly over 10 years in the park?
	5. Terrestrial habitat structure	Monitoring of terrestrial habitat structure (e.g., vegetation cover, structure)	Is terrestrial habitat structure changing in the park?
	6. Primary productivity	Monitoring of terrestrial primary productivity (e.g., NDVI) in each park (will report out in the landscape indicator as NDVI)	Is the primary productivity changing by more than 20% every 10 years in the park?
Aquatic Ecosystem Condition	7. Aquatic chemical and physical conditions	Monitoring of aquatic chemical and physical conditions at select, sentinel sites in the park.	Are the key aquatic chemical and physical parameters changing by more than 20% over a period of 10 years in the park?
	8. Stream habitat structure (water quantity or water velocity)	Monitoring of stream habitat structure in the park	Is the water quantity in major rivers changing by more than 20% over 10 years in each park?

⁸ Measures highlighted in **dark grey** are currently developing and will be part of the EI Monitoring Program for the Montane Cordillera Bioregion. Measures highlighted in **light grey** are still under consideration because additional research is necessary or implementation will not be sustainable.

	9. Aquatic primary productivity	Monitoring the primary productivity of aquatic ecosystems	Is the primary productivity of aquatic ecosystems changing over time?
	10. Aquatic connectivity (aquatic impacts)	Assessing the connectivity of aquatic ecosystems	Is the connectivity of aquatic ecosystems improving over time?
Indicator	Measure	Draft Description	Draft or Example Question
Aquatic Ecosystem Condition	11. Areal extent of human footprint (aquatic impacts)	Buffering all human influences using GIS layers, based on aquatic features, change width and coefficient effect of feature	Is the area of impact of human influences / infrastructure / dispersal of people from nodes, on habitats not changing over time, in the park?
Native Biodiversity	12. Terrestrial bird monitoring	Monitoring of species richness for the entire park, total abundance of resident species, total abundance of priority passerine species, species richness at the individual point counts, abundance of common species, abundance of moderately common species	Is the abundance of resident birds (add other variables in the description) changing by 5% over 5-10 years with 50-60% power?
	13. Terrestrial grizzly bear monitoring	Ongoing methodology and question development	
	14. Terrestrial focal ungulate monitoring (Field Unit specific - caribou, sheep, elk, moose, goats)	Monitoring of relative abundance of one or more ungulate species within the park	Is the abundance of focal ungulate species within their natural range of variation over the next 10 years?
	15. Aquatic macroinvertebrate & algae	Monitoring of benthic invertebrates and algae (primary productivity) in aquatic ecosystems	To be determined
	16. Aquatic fish IBI	Monitoring of fish community structure in moving and still water aquatic ecosystems	To be determined
	17. Amphibians	Monitoring of amphibian species diversity and abundance	To be determined
	18. Winter mammal transects (large carnivores from Farr)	Monitoring of winter mammals biodiversity using track surveys	To be determined
	19. Vascular plants	(Review this measure with a cost estimate for co-located plots, so cost out current proposal against co-located plots at a high enough density within a park to capture variation)	

	20. Qualitative species gain and loss	Monitoring of species gain or loss over time assessed through species lists	To be determined
	21. Wildlife mortality	Monitoring of wildlife mortality on through highways assessed through incidental wildlife observations	To be determined

Indicator	Measure	Draft Description	Draft or Example Question
Landscapes and Geology	22. Regional road density	Monitoring change in regional road density and patterns in the Greater Park Ecosystem	To be determined
	23. Insect disturbance (MPB, looper, budworm)	Monitoring of a focal forest insect species at a park, and in the Greater Park Ecosystem	To be determined
	24. Area of disturbance by disturbance type (fire, avalanche, flood, landslides)	Monitoring of area of disturbance by type based on remote sensing application, reporting by ecosite and at the GPE scale where applicable.	To be determined
	25. Landscape composition (conversion of land in the GPE)	Remote sensing monitoring of composition of landscape (i.e., forest, grassland, alpine, unforested, agricultural) composition in the GPE	To be determined
	26. Fragmentation metrics	Remote sensing monitoring of a suite of fragmentation metrics to assess park-level and regional connectivity	To be determined
Climate and Atmosphere	27. Precipitation & snowpack	Monitoring of precipitation and snowpack in sentinel park sites across time	To be determined
	28. Air temperature	Monitoring of air temperature in sentinel park sites across time	To be determined
	29. Air quality	Monitoring of air quality in sentinel park sites across time	To be determined

Appendix C. List of Research Undertaken in Waterton Lakes National Park (1986-2004)

Note: Prior to 2001 most research projects initiated and conducted by park personnel were not issued research permits, but they are now. Monitoring projects are not issued research permits unless being conducted by non-park staff. Projects "1986-2004" are queried from an Access database of research permits issued for the park.

Project#	ProjectTitle
1986-02	Collecting wood samples in Upper Waterton Lake
1986-03	Forest Insect and Disease Survey
1986-04	Selected aspects of aspen ecology in the Waterton Biosphere Reserve, Alberta
1986-05	1986 Historical Resource Salvage Archaeology Program
1986-06	Analysis of gene-flow in Populus sp. using flavonoids and isoenzyme markers
1986-07	Waterton Lake Historic Resource Survey
1986-08	Analysis of selected mineral licks in the Waterton Biosphere Reserve
1986-09	Oribatida of Waterton Lakes National Park
1986-10	Taxonomy of alpine larch and western larch
1986-11	Biosystematics of <i>Arnica L.</i> subgenus <i>Chamissonis</i> Mag.
1987-03	1987/88 Salvage Archaeology Program
1987-04	Analysis of gene flow in <i>Populus</i> sp. using flavonoids and isoenzyme markers
1988-02	Archaeological Resource Impact Assessment in Western national parks
1988-03	Outline of the biology of Alberta's amphibians and reptiles
1988-19	<i>Parnassius</i> butterfly study
1988-28	A biosystematic study of the <i>Potentilla nivea</i> L. complex of North America
1989-21	Demographic monitoring of <i>Botrychium paradoxum</i> and <i>B. hesperium</i>
1990-06	Ground Penetrating Radar Survey on alluvial Fan-delta Complexes
1990-65	Movements, distribution and ecology of elk south-west of Pincher Creek
1991-01	Measuring exposed strata in the Rocky Mountains
1991-02	Holocene environmental changes in the Canadian Rockies
1991-07	Economics of pollen collection by bumble bees
1992-042	Collections of <i>Dermacentor andersoni</i> (Tick resistance studies)
1992-043	Toxicology study of lake trout
1992-045	Ecological and morphological correlates of reproductive success in the orchids <i>Calypso bulbosa</i> and <i>Cypripedium acaule</i>
1992-047	Population viability and the conservation of genetic resources in large mammals
1993-02	The Sullivan Deposit and its geological environment
1993-06	Researching trilobite biostratigraphy and sedimentology of Cambrian strata in the Rocky Mountains

1993-28 Identifying historical records for regional forest pests
 1994-02 Geological remapping of Alberta Foothills
 1994-04 Collection of June grass germplasm
 1994-06 Effect of grazing on bumble bee density and diversity
 1994-07 Testing methods for indexing predator abundance in WLNP
 1994-09 Bighorn sheep population census
 1995-01 Deglaciation history & environmental change in S.W. Alberta
 1995-16 Zooplankton and benthic invertebrate sampling in Banff and Waterton
 1995-52 Aspen/elk/humans study (Mtn. District)
 1996-001 Bull trout trapping, tagging, and tissue collection
 1996-002 Collect and identify Bryophytes
 1996-01 Ecology of yellow glacier lily
 1996-03 Pollination ecology of Penstemon lyallii
 1996-06 Sampling glacial relict crustaceans in Upper Waterton Lake
 1996-09 Waterton Lakes User Survey
 1996-10 European and native elm bark beetle monitoring
 1996-11 Crandell Campground Users Survey
 1996-12 Interpretive Program Report Card
 1996-13 Parks Canada report card (client satisfaction mail-in)
 1996-14 Riparian Habitat Benchmark Project
 1996-16 DNA analysis-status of native fish populations
 1996-18 Palaeoecology/sediment analysis
 1996-19 Range exclosure re-analysis
 1996-9 Archaeological assessment and inventory of selected portions of WLNP
 1997-01 Chloroplast DNA variation in *Packera conterminus* (=Senecio conterminus)
 1997-012 Crustacean collection in WLNP
 1997-02 Mosses of WLNP in the bryological context of the adjacent Rockies
 1997-04 Waterton Lakes National Park Late Holocene bison population range stability based on bone stable isotope analysis
 1997-05 Examining grassland and forest community changes during the past 3000 years in WLNP through phytolith analysis
 1997-07 Grizzly bear inventory in Southwest Alberta
 1997-08 Native *Cirsium* species and a biocontrol weevil
 1997-09 Does the food chain or environmental factors determine concentration of toxaphene and PCBs in fish of mountain lakes?
 1997-13 Mountain forest recovery following a catastrophic debris flow
 1998-01 Fungus analysis in the Heath (*Ericaceae*) family
 1998-02 Mountain bluebird project

1998-03 Seismic reflection surveys of Upper Waterton Lake

1998-04 Drill and collect lake cores

1998-05 High elevation archaeological inventory

1998-06 Tree-ring based reconstruction of precipitation in WLNP

1998-08 Terrestrial arthropod diversity in WLNP

1998-10 Collect salmonids for Whirling Disease study

1999-02 A comparison of invertebrate diversity on post-fire forested landscapes under different management regimes in southwestern Alberta

1999-03 Grassland restoration on Sofa Fire cat-lines

1999-05 Osprey bioaccumulation of long range toxics

1999-06 Status update for the Cordilleran and willow flycatchers

1999-07 Phylogeographic analysis of long-toed salamanders in Alberta using GIS and RAPDs (Randomly Amplified Polymorphic DNA)

1999-08 Forest Health Network of Natural Resources Canada, Canadian Forest Service

1999-09 Riparian ecosystems and agricultural land use, an elevational and ecological gradient from alpine headwaters to the prairies, SW AB

1999-10 Vegetation sampling for WLNP/GNP veg inventory

2000-01 Monitoring and biodiversity of butterflies in protected and unprotected areas in Southern Alberta

2000-02 Cameron Lake submerged wood collection

2000-03 Sampling the Belt-Purcell Supergroup in WLNP

2000-04 Phylogeography of *Ambystoma macrodactylum*

2000-05 Estimation of brook trout movement in a beaver pond complex using multi-stage capture-recapture models

2000-06 Field surveys for S1 and S2 ranked species (ANHIC classification of rare and vulnerable wildlife) in WLNP

2000-11 Population, habitat, and genetic characteristics of westslope cutthroat trout in Alberta

2000-12 Waterton arachnida survey

2000-13 Provincial northern leopard frog survey

2000-14 Moss (*Lescuraea incurvata*) collection

2000-15 Fern frond education

2000-42 Native forb and legume seed collection in WLNP, BNP, and JNP

2001-03 Multiple origins of asexual polyploids in *Townsendia hookeri*

2001-035 Systematics of lygus bugs and aphids of the Pacific Northwest

2001-04 Linnet Lake long-toed salamander roadkill prevention and population estimation

2001-05 Genetic variability within *Festuca campestris* and *F. hallii*

2001-08 Systematics and biogeography of Ceratzoidea (Acari: Oribatida) of North America

2001-1 Sedimentology and origin of selected stratigraphic units, Belt/Purcell Supergroup (Mesoproterozoic, 1.5 Ga), central-western N.America

2001-10 Determining species diversity and distribution of subalpine and alpine grasshoppers in the Rocky Mountains of AB. and B.C.

2002-01 Population assessment of Bolander's quillwort in WLNP

2002-02 Wishbone MAPS Station, WLNP

2002-03 Limber pine ecology and health in WLNP

2002-04 Ladybug biodiversity in WLNP

2002-05 Evolutionary consequences of clonal reproduction in trembling aspen

2002-08 The Bridgland Repeat Survey Project, WLNP

2002-09 Effects of introduced fish on the demography and life-history of larval Long-toed Salamanders

2002-10 Conservation status of *Cirsium scariosum* in western Canada

2002-15 Molecular phylogenetic analysis of the extant vascular plants based on sequence data from RNA polymerase II genes

2002-16 Enhancing management of protected areas: Mexican and Canadian perspectives

2003-01 Field survey for *Satyrium fuliginosum*

2003-010 Effects of inbreeding and white pine blister rust on genetic diversity of whitebark pine (*Pinus albicaulis*)

2003-03 Macro-invertebrate and zooplankton biodiversity in lakes, ponds, and rivers in WLNP

2003-05 Testing for differences in tree growth and water-use efficiency in Douglas fir trees during five years of contrasting summer rainfall

2003-06 Whitebark pine and blister rust

2003-08 Historic landscape change in the grassland/aspens/montane interface in WLNP

2003-09 The evolutionary origins of *Erigeron trifidus*, a rare plant in Alberta

2003-10 Range vegetation and carrying capacity assessment in WLNP

2003-11 A quantitative study of spotted knapweed (*Centura maculosa*) versus native vegetation in WLNP

2003-12 Long term evolution of a montane forest tree stand in the Eastern Canadian Rockies after a fire disturbance

2004-0023L The biogeography and ecology of deepwater sculpin: conservation of a glacial relict

2004-02 Collect voucher specimens of native and non-native plants for verification and deposition in herbaria

2004-03 Pit-fall trapping in bear country: particularly their use within our parks

2004-04 Dendroecological analysis of stand dynamics and disturbance by mountain pine beetle and blister rust in WLNP

2004-05 Forest invasion in subalpine meadows of northwestern WLNP

2004-06 Landscape change in the aspen parklands of WLNP

2004-07 Landscape change in the treeline using repeat photography

2004-08 Conduct visitor surveys on the impact of climate change on nature-based tourism

2004-09 Subalpine and alpine grasshopper biogeography and ecology

2004-10 To collect the copepod *Hesperodiaptomus shoshone* in Waterton and Jasper NPs

2004-11 Collect pygmy whitefish and deepwater sculpin

JNP04-05 Development, testing, delivery of interdisciplinary tools and models to integrate grizzly bear conservation into forest management in AB

Appendix D. List of Research Undertaken in Waterton Lakes National Park (2005-2007)

Note: Projects "2005-2007" are queried from the national Parks Canada on-line permit system with multi-park permits issued in another park being added directly to the spreadsheet.

WLNP Research Subjects: 2005-2007

Discipline	Project Title
Archaeology	Waterton Lakes National Park archaeological resource management programme
Archaeology	Waterton Lakes National Park threatened archaeological site excavation, Site 572R
Natural Science	Historical Effects of Mountain Pine Beetle in Rocky Mountain Parks, Canada
Natural Science	Whitebark Pine Conservation In the Mountain National Parks
Natural Science	Microclimatic variation and photosynthesis processes in the eastern slopes of the Rocky Mountains of S. Alberta
Natural Science	Visual Narratives in Waterton Lakes National Park
Natural Science	Identification of plant pathogens in an undisturbed Canadian forest
Natural Science	Evaluating the Effectiveness of Parks and Protected Areas: does indigenous co-management make a difference?
Natural Science	Electroshocking non-native fish in the Reintroduction of Northern Leopard Frog
Natural Science	Bighorn sheep ecology and conservation in Waterton-Glacier International Peace Park
Natural Science	Using Historical Ecology to Investigate Landscape Change in the Aspen Parklands of Waterton Lakes N. Park
Natural Science	Investigation of Wolf Demography and Territory Structure in Southwest Alberta
Natural Science	Forest Health Assessment
Natural Science	Parasitoids wasps of the genera Peristenus and Leiophron (Insect: Hymenoptera: Braconidae) of North America
Natural Science	Biodiversity survey of terrestrial arthropods of WLNP
Natural Science	Preliminary identification of ticks and associated pathogens from Waterton Lakes National Park, Alberta.
Natural Science	Natural and man-imposed threats to biodiversity in alpine lakes, ponds and streams
Natural Science	Influence of nectarless flowers on pollinator behaviour
Natural Science	Dytiscid (diving) beetle communities in Alberta
Natural Science	Role of assortative mating on orchid diversification and speciation
Natural Science	Collection of vegetation plot data in mountain national parks
Natural Science	Whitebark pine regeneration and survival
Natural Science	Millenium Bank Seed Collection Expedition
Natural Science	Plant Diversity at selected wetlands and associated uplands in Waterton Lakes National Park
Natural Science	Mercury biomagnification and food web structure in the upper and middle lakes, Waterton Lakes National Park
Natural Science	Investigating Tree Establishment in Critical Subalpine Meadow Habitat
Natural Science	Field-testing butterfly habitat model
Natural Science	Tree-Ring Reconstructions of the Long-Term Flow of the Milk and St.Mary's Rivers
Natural Science	Trophic Cascades and Stand Dynamics of Aspen (Populus tremoloides), Cottonwood (Populus spp.), and other
Natural Science	Woody Browse Species in Waterton Lakes National Park

Natural Science	Geographic and adaptive consequences of past climate warming on Douglas-fir
Natural Science	Adopt A Plant Alberta: assessment of rare plants
Natural Science	Alpine freshwaters as sentinels of global change over Alberta
Natural Science	Occurrence of Mycobacteria in different environments
Natural Science	Assessment and cultivation of the ectomycorrhizal fungi crucial to whitebark pine: Waterton-Glacier Peace Park
Natural Science	Seasonal activity of montane wood ticks, Dermacentor andersoni.
Natural Science	Herbarium Collection - as required for completion of RRM 256, Rangeland Habitat Management.
Natural Science	Validation of a subalpine-tundra treeline model
Natural Science	Southwest Alberta Montane Elk Study
Social Science	Exploring the regional integration of protected areas: the case of Canadian national parks.
Social Science	Geography of american national parks on the borderline : transnational cooperation, local communities and relations between the State, the Federal and the communities in and around the parks
Social Science	Web-based surveys for the mountain parks (a.k.a. Online Panels)
Social Science	2006 staff evaluation of the Mountain Guide
Social Science	Making collaboration work: an exploratory case study of two Canadian national parks

Appendix E. Organizations in the Crown of the Continent Network (2008)

Note: Organizations engaged in CoC regional stewardship (www.crownofthecontinent.info/network.html).

Alberta Agriculture, Food and Rural Development
Alberta Agriculture, Food and Rural Development -Conservation Connection
Alberta Environment
Alberta Fish and Game Association
Alberta Natural Heritage Information Centre
Alberta Off-Road Vehicle Assoc
Alberta Stewardship Network
Alberta Sustainable Resource Development
Alberta Tourism, Parks, Recreation and Culture

Alberta Tourism, Parks, Recreation and Culture - Head Smashed-In Interpretive Center
Alberta Tourism, Parks, Recreation, and Culture - Parks, Conservation, Recreation & Sports
Alberta Tourism, Parks, Recreation, and Culture- Managing Parks & Protected Areas
Alberta Tourism, Parks, Recreation, and Culture-Cultural Facilities and Historical Resources Division
Alberta Wilderness Association
Alpine Artisans
American Wildlands

B.C Ministry of Agriculture & Lands
B.C. Ministry of Economic Development
B.C. Ministry of Sustainable Resource Management
B.C. Ministry of Energy, Mines, & Petroleum
B.C. Ministry of Environment
B.C. Ministry of Forests and Range
B.C. Ministry of Small Business and Revenue
B.C. Ministry of Tourism, Sports and the Arts
Blackfeet Community College
Blackfeet Country
Blackfoot Challenge
Blood Tribe
Blood Tribe Land Management Department
Bob Marshall Wilderness Foundation
? Canadian Consulate General-Denver
Canadian Parks & Wilderness Society-Calgary/Banff Chapter
Castle Crown Wilderness Coalition
Chambers of Commerce
Chinook Institute for Community Stewardship
Cities and Towns
Cities, Towns, Municipal Districts, Counties, Conservation Districts in the Crown
Citizens for a Better Flathead
Clearwater Resource Council

Coalition to Protect the Rocky MTN Front
College of the Rockies
Confederated Salish/Kootenai Tribal Council
Confederated Salish Kootenai People's Center
Confederated Salish-Kootenai Tribe
Conservation Districts
Counties
Cowboy Trail Tourism Association
Cows and Fish Program; Alberta Riparian Habitat Management Society
Crown of the Continent Environmental Education Consortium
Crowsnest Conservation Society
Defenders of Wildlife
East Kootenay Conservation Program
Ecosystem Management Research Institute
Five Valley Land Trust
Flathead Valley Community College
Flathead Basin Commission
Flathead Convention and Visitors Bureau
Flathead Lakers
Flathead Snowmobile Association/FCVB
Flathead Values
Frank Slide Interpretive Center
Friends of the Rocky Mountain Front
Glacier Institute
Glacier National Park
Glacier National Park Fund
Glacier Natural History Association
Glacier Park, Inc.
Great Bear Foundation
Great Northern Environmental Stewardship Area
Haskill Basin Watershed Council
Heart of the Rockies Initiative
Integrated Land Management Bureau
Kendall Foundation
Keystone Conservation
Kootenai River Network
Ktunaxa Kinbaset Tribal Council
Land Stewardship Center of Canada
Lincoln Institute of Land Policy
Livingstone Landowners Group
Miistakis Institute
Milk River Watershed Council Canada
Montana Scenic Loop
Montana Watershed Coordination Council
Montana Wilderness Association
Montanans for Multiple Use

MT DNRC- Forestry Division
MT Department of Environmental Quality
MT Department of Fish, Wildlife and Parks
MT Department of Natural Resources and Conservation
MT DFWP- Region 1
MT DFWP- Region 2
MT DFWP- Region 4
MT DNRC - Oil and Gas Conservation Division
MT DNRC- Conservation & Resource Development Division
MT DNRC- Reserved Water Rights Commission
MT DNRC- Trust Land Mgt Division
MT DNRC- Water Resources Division
MT Governor's Office
National Geographic Society
National Park Conservation Association-Glacier Field Office
Native Forest Network
Natural Resource Defense Council Wild Bears Project/Border Bears
Nature Conservancy Canada- Alberta
Nature Conservancy Canada -British Columbia
North West Montana Historical Society
Northern Rockies Conservation Cooperative
Northfork Preservation Association
Northwest Connections
Oldman River Regional Services Commission
Oldman Watershed Council
Parks Canada
Pekisko Group
Piikani Nation, Head-Smashed-In World Heritage Site
Pincher Creek
Plum Creek Timber Company
Prairie Crocus Ranching Coalition
Rocky Mountain Grizzly Centre
Salish Kootnai College
Seeley Lake Community Council
Sonoran Institute Northern Rockies Program
South Alberta Land Trust Society (SALTS)
Stewardship Center for British Columbia
Stillwater State Forest
Sun Watershed Group
Swan Ecosystem Center
Swan River State Forest
Swift Creek Watershed Group
Teton Watershed Group
The Nature Conservancy
Tobacco Plains Band
Trail of the Great Bear

Travel Montana
Trust for Public Lands
U.S. Bureau of Indian Affairs
U.S. Bureau of Land Management
U.S. EPA Region 8
U.S. Fish and Wildlife Service - Montana
U.S. Fish and Wildlife Service- Grizzly Recovery
U.S. Fish and Wildlife Service-National Bison Range
U.S. Fish and Wildlife Service-Partners for Fish and Wildlife Program
U.S. Forest Service - Flathead NF
U.S. Forest Service - Helena NF
U.S. Forest Service - Lewis and Clark NF
U.S. Forest Service - Region 1
U.S. Forest Service -Kootenai National Forest
U.S. Forest Service- Lolo National Forest
U.S. Forest Service Regional Tourism and Recreation
U.S. Forest Service- Rocky Mountain Research Station
U.S. Forest Service- Seeley Lake
U.S. Geological Survey
University of Montana- Rocky Mountains Cooperative Ecosystem Studies Unit (RM-CESU)
University of Calgary
University of Lethbridge
University of Montana - Flathead Lake Biological Station
University of Montana- EVST
University of Montana Institute for Tourism and Recreation Research
University of Montana PPRI
University of Montana, Dept. of Ecosystem & Conservation Sciences, School Forestry & Conservation
University of Montana/Boone and Crockett Club & Teddy Roosevelt Memorial Ranch
Vital Ground
Waterton Biosphere Association
Waterton Lakes National Park
Waterton-Glacier Peace Park Association
Whitefish Lake Institute
Wilderness Society
Wildlife Society- Alberta Chapter
Wildsight
Yellowstone to Yukon Conservation Initiative